GRIFFITHS'
MATERIA MEDICA
AND
PHARMACY

Ab. 3. 77
~~Fb*. 3. 29~~

R38705

By order of the College, this Book is not to be taken out of the Library (except after 10 P.M. *until* 10 A.M.) *for one month from this date.*

PHYSICIANS' HALL, 11/3/87

7/6

GRIFFITHS'
MATERIA MEDICA AND PHARMACY.

Digitized by the Internet Archive
in 2015

https://archive.org/details/b21904893

GRIFFITHS'

MATERIA MEDICA AND PHARMACY;

FOR THE USE OF

MEDICAL AND PHARMACEUTICAL STUDENTS.

THIRD EDITION.

EDITED, AND IN PART WRITTEN, BY
ALFRED S. GUBB, L.R.C.P., M.R.C.S., ETC.,
GOLD MEDALLIST, PRIZEMAN IN MATERIA MEDICA, WESTMINSTER HOSPITAL:
LATE RESIDENT MEDICAL OFFICER, FRENCH HOSPITAL, LONDON.

ROYAL COLLEGE OF PHYSICIANS. EDINR
LIBRARY

LONDON:
BAILLIÈRE, TINDALL, AND COX,
20, KING WILLIAM STREET, STRAND.
1887.

[*All Rights Reserved.*]

AUTHOR'S PREFACE TO FIRST EDITION.

THERE are few professed teachers of Materia Medica who will not coincide in my opinion that there exists a necessity for reform in the manner of teaching this subject in the medical schools. In a paper "On the Teaching of Materia Medica and Therapeutics," which I communicated to *The Practitioner* some years since, I stated very fully my views on this subject, and advocated very earnestly the dissociation of Therapeutics from the chemical and botanical details constituting Materia Medica, so-called. I suggested that Materia Medica proper and Pharmacy should be taught in the earlier period of the student's curriculum, and that Therapeutics should be taught concurrently with Pathology and the Practice of Medicine. Shortly after the publication of this paper, many eminent lecturers on Materia Medica took action in the matter, and made a representation on the subject to the General Council of Medical Education. The hopeful anticipation that the reform advocated will ere long be effected is one reason for the appearance of the present volume.

I had, however, another object in this publication, namely, the special wants of a numerous class of gentlemen who are now qualifying for the Pharmaceutical profession.

In the comparative exclusion of Therapeutics, in the peculiar mode of arrangement, and in the introduction of tabular matter, this book differs from other works on Materia Medica. The practical value of the tables for educational purposes I have tested by a long experience in teaching. The portion of the book treating of Pharmacy was formerly published as a separate volume, under the title of "Notes on the Pharmacopœial Preparations." Should the same favourable reception be accorded to it in its new garb as when it first appeared, I shall have every reason to be satisfied with the result of my labour.

In conclusion, I would impress on my readers the necessity of studying Materia Medica *practically* as far as possible. A very small outlay, indeed, will enable a student to provide himself with reagents and apparatus for performing most of the tests and processes recorded in these pages; as well as a collection of Materia Medica specimens to enable him to become familiar with the appearances, etc., of drugs.

W. HANDSEL GRIFFITHS.

EDITOR'S PREFACE TO THE THIRD EDITION.

HAVING been asked by the publishers to bring this work into conformity with the last edition of the British Pharmacopœia, I have willingly complied with the request. The favour with which Dr. Griffiths' former publications on similar subjects had been received, was to me a powerful inducement to do so.

The original plan of the work has been as closely followed as was consistent with the numerous alterations, additions, and subtractions which have been rendered necessary, while the results of recent investigations have been freely incorporated with the text.

I am greatly indebted to Mr. F. Hudson Cox for his kind assistance in correcting the proofs, and for his valuable suggestions in relation thereto.

A. S. GUBB.

THE GROVE, HAMMERSMITH, W.
January, 1887.

ERRATA.

Page 9, *for* "$C_4H_6O_3 = 102$" *read* "$HC_2H_3O_2 = 60$."
,, 12, *for* "$SO_2 = 64$" *read* "$H_2SO_3 = 82$."
,, 14, *for* "$H_2O + C_4H_6O_3$" *read* "$2HC_2H_3O_2$."
,, 109, *for* "$K_6Fe_2Cy_2$" *read* "$K_6Fe_2Cy_{12}$."
,, 120, *for* "$Na_2H_2S_2O_4.4H_2O$" *read* "$Na_2S_2O_3,5H_2O$.'
,, 139, *for* "$2H_2O_2$" *read* "$2H_2O$."
,, 140, *for* "ZHO, H_2O" *read* "ZnO,H_2O."
,, 167, *for* "Sterenliaceæ" *read* "Sterculiaceæ."

GRIFFITHS'

MATERIA MEDICA AND PHARMACY.

PART I.

MATERIA MEDICA.

INORGANIC SUBSTANCES.

CARBON.

	B. P. Preps.	Strength.	Dose.	Action and Use.
CARBO ANIMALIS	—	—	—	—
Animal Charcoal Bone Black	Carbo Animalis Purificatus	—	20 to 60 grs.	Absorbent. Used in cases of flatulent dyspepsia and fœtid eructations. As an antidote to the organic poisons.
CARBO LIGNI	—	—	20 to 60 grs.	
Wood Charcoal	Cataplasma Carbonis	1 in 28	—	Antiseptic and deodorant application to foul ulcers.

Carbo Animalis.

The residue of bones which have been exposed to a red heat *without the access of air.* It consists of about 10 per cent. of charcoal and 90 per cent. of phosphate and carbonate of calcium. The residue of bones which have been burned to a white ash *in contact with the air* constitutes *os ustum* or "bone-ash." This consists principally of phosphate of calcium, mixed with about 10 per cent. of carbonate of calcium and a little fluoride of calcium and phosphate of magnesium.

Carbo Animalis Purificatus is animal charcoal from which the earthy salts have been almost wholly removed. This is effected as follows :—Mix hydrochloric acid (10 oz.) with distilled water (1 pint), and add boneblack in powder (16 oz.), stirring occasionally. Digest at a moderate heat for two days, agitating from time to time; collect the undissolved charcoal on a calico filter, and wash with distilled water till what passes through gives scarcely any precipitate with nitrate of silver, showing absence of chlorides. Dry the charcoal, and then heat it to redness in a closely covered crucible. The animal charcoal thus purified is a black pulverulent substance, inodorous and almost tasteless ; it absorbs gases and odours. Tincture of litmus diluted with twenty times its bulk of water, agitated with it and thrown upon a filter, passes through colourless. It should not effervesce on the addition of hydrochloric acid (carbonate of calcium), and the acid to which it has been added should not yield a precipitate with ammonia (phosphate of calcium). When burned at a high temperature, with a little red oxide of mercury and free access of air, it leaves only a slight residue, and is thus distinguished from vegetable charcoal and from boneblack.

Carbo Ligni.

Wood charred by exposure to a red heat without access of air. Wood yields from 17 to 23 per cent. of charcoal. It is met with in black, brittle, porous masses, odourless and tasteless, very light, and retaining the shape and texture of the wood from which it was obtained. When burned at a high temperature with free access of air, it should not leave more than 2 per cent. of ash. It absorbs gases and odours, and decolourises, but not so energetically as animal charcoal. It is insoluble in water, and is a bad conductor of heat, but a good one of electricity.

SULPHUR.

	B. P. Preps.	Strength.	Dose.	Action and Use.
SULPHUR SUBLIMATUM Sublimed Sulphur Flowers of Sulphur	—	—	20 to 60 grs.	In small doses, stimulant to skin and mucous membranes. In large doses, laxative. Given in chronic cutaneous diseases, chronic bronchitis, mercurial ptyalism, etc. Externally in scabies and vegetable parasitic diseases. Used in making Emplastrum Ammoniaci cum Hydrargyro, Empl. Hydrargyri, and Pulv. Glycyrrhizæ Co.
	Confectio Sulphuris	4 pts. in 9	1 to 2 drms.	
	Unguentum Sulphuris	1 pt. in 5	—	
SULPHUR PRÆCIPITATUM Lac Sulphuris Milk of Sulphur	—	—	20 to 60 grs.	
SULPHURIS IODIDUM	—	—	—	—
Iodide of Sulphur	Unguentum Sulphuris Iodidi	30 grs. to 1 oz.	—	The ointment is used as an alterative, resolvent, and parasiticide.

Sulphur Sublimatum.

Sulphur prepared from crude or rough sulphur by sublimation. It may also be obtained from metallic sulphides; but it is then liable to contain impurities, as sulphide of arsenic. It is a slightly gritty powder of a fine greenish-yellow colour, without taste, and without odour unless heated; sp. gr. 1·98; burns in open vessels with a blue flame and the evolution of sulphurous acid. Insoluble in water, but soluble in hot oil of turpentine, in bisulphide of carbon, and to a slight extent in oils. It is entirely volatilised by heat, showing absence of fixed impurities, and does not redden moistened litmus paper, indicating the absence of sulphurous and sulphuric acids. Solution of ammonia, agitated with it, and filtered, does not on evaporation leave any residue, showing freedom from orpiment (As_2S_3).

Sulphur Præcipitatum.

Heat sublimed sulphur (5 oz.) and slaked lime (3 oz.), previously well mixed, in a pint of water, stirring diligently with a wooden spatula; boil for fifteen minutes, and filter. Boil the residue again in half a pint of water, and filter. Let the united filtrates cool; dilute with two pints of water, and, in an open place or under a chimney, add in successive quantities hydrochloric acid (8 oz.), previously diluted with a pint of water, until effervescence ceases, and the mixture acquires an acid reaction. Allow the precipitate to settle, decant off the supernatant liquid, pour on fresh distilled water and continue the purification by affusion of distilled water, and subsidence, until the fluid ceases to have an acid reaction and to precipitate with oxalate of ammonium, showing that all the resulting (soluble) chloride of calcium has been removed. Collect the precipitated sulphur on a calico filter, wash it once with distilled water, and dry it at a temperature not exceeding 120°.

The following reactions occur in this process:—

$$(1)\ 3Ca2HO + 6S_2 = 2CaS_5 + CaS_2O_3 + 3H_2O.$$
$$(2)\ 2CaS_5 + CaS_2O_3 + 6HCl = 3CaCl_2 + 3H_2O + 6S_2.$$

Precipitated sulphur is a grayish-yellow soft powder, free from grittiness and from the smell of sulphuretted hydrogen. When heated in an open vessel, it burns with a blue flame and the evolution of sulphurous acid. Entirely volatilised by heat. Under the microscope it is seen to consist of opaque globules without any admixture of crystalline matter, showing the absence of sulphate of calcium, which would be present if sulphuric acid were used instead of hydrochloric acid in the preparation. Otherwise it corresponds with sublimed sulphur.

Sulphuris Iodidum.

Rub iodine (4 oz.) and sublimed sulphur (1 oz.) together in a Wedgwood mortar until they are thoroughly mixed. Put the mixture into a flask, close the orifice loosely, and apply a gentle heat so that the colour of the mass shall become gradually darkened. When the colour has become uniformly dark throughout, increase the heat so as to produce liquefaction. Then incline the flask in different directions, in order to return into the liquid any portion of the iodine which may have been condensed on the inner surface of the vessel. Lastly, withdraw the heat, and when the liquid has congealed, remove the mass by breaking the flask, reduce it to pieces, and keep these in a well-stopped bottle.

Iodide of sulphur is an unstable compound, with a strong odour of iodine; it is grayish-black and crystalline; soluble in glycerine (1 in 60), insoluble in water. If 100 grains be well boiled in water the iodine will pass off in vapour, and 20 grains of sulphur will remain.

PHOSPHORUS.

	B. P. Preps.	Strength.	Dose.	Action and Use.
PHOSPHORUS Phosphorus	—	—	$\frac{1}{30}$ gr.	Tonic and stimulant. Employed in adynamia, low fevers, neuralgia, and in some chronic diseases of the nervous system and of the skin. Used for making Acidum Phosphoricum Concentratum and Dilutum.
	Oleum Phosphoratum.	$\frac{1}{20}$ gr. in 5 mins.	5 to 10 mins.	
	Pil. Phosphori	$\frac{1}{18}$ gr. in 5 grs.	3 to 6 grs.	

Phosphorus.

A non-metallic element obtained from bones. The following is an outline of the process:—Digest bone-ash with diluted sulphuric acid; sulphate of calcium and superphosphate of calcium are thus formed, the former being precipitated, and the latter held in solution :—

$$Ca_3 2PO_4 + 2H_2SO_4 = 2CaSO_4 + CaH_4 2PO_4.$$

By evaporation, the superphosphate is converted into metaphosphate :—

$$CaH_4 2PO_4 - 2H_2O = Ca2PO_3,$$

and the latter is heated with charcoal :—

$$3(Ca2PO_3) + C_{10} = Ca_3 2PO_4 + 10CO + P_4.$$

The crude phosphorus thus obtained is collected in a receiver filled with cold water. It is purified by melting it under water and shaking it with a mixture of sulphuric acid and bichromate of potash, to remove any traces of oxide, etc. It is finally cast into sticks in glass moulds.

Phosphorus is a waxy-looking substance, usually in the form of cylinders, from being cast into moulds; almost colourless and transparent when fresh, but gradually becoming coated with a white layer ; luminous in the dark, from becoming oxidised and forming phosphorous anhydride (P_2O_3) ; very inflammable ; sp. gr. 1·77 ; melts at 110° F. ; at 32° it is crystalline and brittle ; insoluble in water ; soluble in ether, oils, and true naphtha ; entirely soluble in boiling oil of turpentine and bisulphide of carbon ; when burnt it forms phosphoric anhydride (P_2O_5). It should be kept in water and in the dark. Phosphorus also exists in a peculiar allotropic condition, known as amorphous or red phosphorus, in the form of a red powder, which may be exposed to the air without giving off any fumes, and may be heated in the open air till the temperature reaches 500°, at which point it takes fire, etc. This variety is not soluble in bisulphide of carbon ; when volatilised it reverts to the state of ordinary phosphorus.

IODUM.

	B. P. Preps.	Strength.	Dose.	Action and Use.
IODUM Iodine	—	—	—	Internally iodine influences the glandular and absorbent system, and is an alterative and resolvent. Given in scrofula, bronchocele, glandular enlargements, indurations; in syphilis, rheumatism, gout, dropsy, skin diseases, etc. Externally irritant or vesicant, and resolvent.
	Linimentum	1⅛ in 10	—	
	Liquor	1 in 20	—	
	Tinctura	1 in 40	5 to 20 mins.	
	Unguentum	1 in 31	—	
	Vapor	—	—	To lessen expectoration and allay cough.

Iodum.

Is contained in the iodides of arsenic, mercury, potassium, sodium and sulphur, and in the syrup and pill of the iodide of Iron.

A non-metallic element obtained principally from the ashes of sea-weeds. On burning the sea-weeds a dark mass termed "kelp" is obtained; from this the soluble salts, iodides, etc., are obtained by solution in water; the solution is then concentrated and treated with sulphuric acid to form hydriodic acid, and then distilled with black oxide of manganese. Iodine volatilises, and is condensed in receivers. The following is the reaction:—

$$2NaI + 2H_2SO_4 + MnO_2 = Na_2So_4 + MnSO_4 + I_2.$$

In like manner chlorine and bromine can be obtained from chlorides and bromides.

Iodine occurs in laminar crystals, of a peculiar odour, dark colour, and metallic lustre, which, when heated, yield a beautiful violet-coloured vapour; very sparingly soluble in water, but more so in alcohol and benzine, it is freely dissolved by ether and chloroform, and by a solution of iodide of potassium.

The aqueous solution strikes a deep blue colour with starch. It sublimes without leaving any residue, and the portion that first comes over does not include any slender colourless prisms emitting a pungent odour, showing the absence of cyanide of iodine. It should not moisten bibulous paper, showing its freedom from water. Fixed impurities, as coal, black-lead, etc., are detected by sublimation. 12·7 grains dissolved in an ounce of water containing 15 grains of iodide of potassium require for complete discolouration 1,000 grain-measures of the volumetric solution of hyposulphite of sodium. [For an explanation of this test, see "Volumetric Analysis."]

BROMUM.

	B. P. Preps.	Strength.	Dose.	Action and Use.
Bromum Bromine	—	—	—	Caustic, deodorizer and disinfectant. Used to prepare the bromides of ammonium, sodium, and potassium.
	Solution of (App. II.)	2 mins. to 1 oz.	—	Test for detecting iodine in the bromides.

Bromum.

Obtained chiefly from bromide of magnesium, which is found in sea water and certain springs, by heating it with black oxide of manganese and sulphuric acid :—

$$MgBr_2 + MnO_2 + 2H_2SO_4 = MgSO_4 + MnSO_4 + 2H_2O + Br_2.$$

Bromine is a dark brownish-red, very volatile liquid, with a strong and disagreeable odour. Its specific gravity is 2·96 to 3·14; with water it forms a crystalline hydrate at 32°. Pure bromine can be frozen. At the common temperature of the air it gives off red vapours, and at a temperature of 135° to 145° F. it boils. Like chlorine, it bleaches in the presence of water. Agitated with solution of soda in such proportion that the fluid remains very slightly alkaline, it forms a colourless liquid, owing to formation of bromide and bromate of sodium, which are colourless compounds:—

$$Br_6 + 6NaHO = 5NaBr + NaBrO_3 + 3H_2O.$$

If this colourless liquid be coloured by the further addition of a small quantity of the bromine, it does not become blue on the subsequent addition of a cold solution of starch, showing the absence of iodine. Bromine is slightly soluble in water (1 in 30), more so in alcohol, and very soluble in ether.

THE ACIDS.

Acid.	B. P. Preps.	Strength.	Dose.	Action and Use.
Acidum Aceticum Acetic Acid $HC_2H_3O_2 = 60$	—	—	—	Used in preparation of the officinal acetates and of the Ext. Colch. Acet., Oxymel, and Tr. Ferri Acetatis.
	Acid. Aceticum Dilutum	1 in 8	1 to 2 drms.	Refrigerant, and allays thirst of fever. Locally astringent, and used in sweating and irritation of skin. Employed in preparation of Acetum Scillæ and Liq. Morphinæ Acetatis.
Acidum Aceticum Glaciale Glacial Acetic Acid $C_4H_6O_3 = 102$	—	—	—	Caustic, irritant, vesicant and escharotic. Applied to warts, corns, and parasitic skin diseases. Used in preparation of Acetum Cantharidis, Lin. Tereb. Acet., Liq. Ferri Acet. fort., and Mistura Creasoti.
Acidum Arseniosum Arsenious Acid or White Arsenic $As_2O_3 = 198$	—	—	$\frac{1}{60}$ to $\frac{1}{12}$ gr.	Externally escharotic and antiseptic. An alterative in skin diseases; antiperiodic in intermittent fever, and neuralgia: used also in chorea and pulmonary diseases.
	Liquor Arsenicalis	1 gr. in 110 m.	2 to 8 mins.	Used internally as above.
	Liq Arsenici Hydrochloricus	1 gr. in 110 m.	2 to 8 mins.	Ditto.
	Arsenii Iodid. Liq. Arsenii et Hydrarg. Iodidi	1 in 110 m.	10 to 30 mins.	Ditto.

The Acids (*continued*).

Acid.	B. P. Preps.	Strength.	Dose.	Action and Use.
Acidum Benzoicum	—	—	10 to 15 grs.	Stimulating expectorant and diuretic. Used in bronchitis, urinary affections, etc. Contained in Tinct. Camph. Co. and in Tinct. Opii Ammoniata. Is an antiseptic.
Benzoic Acid $HC_7H_5O_2=122$	Troch. Acid. Benzoici	½ gr. in each	—	
	Ammonii Benzoas	—	10 to 20 grs.	*Vide* compounds of Ammonium.
Acidum Boricum	—	—	5 to 30 grs.	Is an antiseptic, is used as an eye lotion and as a dressing for ulcerating and granulating surfaces.
Boric or Boracic Acid $H_3BO_3=62$	Ung. Acidi Borici	1 pt. in 6	—	
Acidum Carbolicum	—	—	1 to 3 grs.	The pure acid is a powerful caustic. Externally employed as a deodorant, antiseptic and parasiticide. Given in septic diseases, and in flatulent dyspepsia and vomiting.
Carbolic or Phenic Acid $HC_6H_5O=94$	Acid. Carbol. Liquefactum	—	1 to 4 mins.	
	Glycerinum Acidi Carbolici	1 pt. in 6 by weight	5 to 10 mins.	
	Suppos. Acidi Carbol. cum Sapone	1 gr. in each	—	
	Ung. Acidi Carbolici	1 pt. in 19.	—	
Acidum Chromicum	—	—	—	Is a powerful antiseptic. Used as an application to warty excrescences or indolent ulcers.
Chromic Acid $CrO_3=100{\cdot}4$	Liq. Acidi Chromici	1 pt. in 4	—	
Acidum Citricum Citric Acid $H_3C_6H_5O_7.H_2O=210$	—	—	10 to 30 grs.	Refrigerant in thirst of fever. Used in the preparation of Vinum Quininæ and the official Citrates.
Acidum Gallicum Gallic Acid	—	—	2 to 10 grs.	Astringent in hæmorrhages, diarrhœa, dysentery, sore throats, etc. It is less astringent topically than tannic acid.
$H_3C_7H_3O_5.H_2O=188$	Glycerinum Acidi Gallici	1 pt. in 6 by weight	10 to 60 mins.	
Acidum Hydrobromicum Dilutum	—	—	—	As a substitute for other bromides; in combination with quinine to prevent cerebral symptoms; also in neuralgia, nervous exhaustion, etc.
Diluted Hydrobromic Acid $HBr=81$	—	10 per cent. of pure acid	15 to 50 mins.	

The Acids (*continued*).

Acid.	B. P. Preps.	Strength.	Dose.	Action and Use.
Acidum Hydrochloricum Hydrochloric or Muriatic Acid $HCL = 36{\cdot}5$	— Acid. Hydrochlor. Dil.	— 1 min. strong acid in 3¼ mins.	— 10 to 30 mins.	The strong acid is caustic. Used in prep. of the officinal chlorides. The dilute acid is refrigerant and tonic, and is given in fevers, dyspepsia, etc.
	Acid. Nitro-Hydroch. Dil.	1½ and 2 mins. in 20 mins.	5 to 20 mins.	Tonic and alterative. Locally as a bath in certain hepatic affections.
Acidum Hydrocyanicum Dilutum Hydrocyanic or Prussic Acid $HCN = 27$	— Vapor Acidi Hydrocyanici	2 per cent. 10 to 15 mins. in 1 drm.	2 to 8 mins. —	Sedative in painful alimentary affections, vomiting, cough, certain nervous diseases. Externally allays itching, irritation of skin, neuralgia, etc. Contained in Tinct. Chloroformi et Morphinæ.
Acidum Lacticum Lactic Acid $HC_3H_5O_3 = 90$	— Acid. Lacticum Dil.	— 15 per cent.	— ½ to 2 drms.	As spray or lotion to dissolve diphtheritic membranes. Used in diabetes.
Acidum Meconicum Meconic Acid $H_3C_7HO_7 = 200$	—	—	—	Used in the preparation of Liquor Morphinæ Bimeconatis.
Acidum Nitricum Nitric Acid or Aqua fortis $HNO_3 = 63$	— Acid. Nitricum Dil. Acid. Nitro-Hydroch. Dil.	— 1 min. strong acid in 5 mins. 1½ and 2 mins. of strong acids in 16 mins.	— 10 to 30 mins. 5 to 20 mins.	Strong acid used as a caustic in phagedenic sores, nævi, piles, etc., and in preparation of the officinal nitrates. Both dilute acids are refrigerant, tonic, and alterative. Used in fevers, dyspepsia, torpidity of liver, the phosphatic diathesis, in scrofula and certain skin diseases.
Acidum Oleicum Oleic Acid $HC_{18}H_{33}O_2$	—	—	—	Is used in the preparation of the officinal oleates.
Acidum Phosphoricum Concentratum Concentrated Phosphoric Acid $H_3PO_4 = 98$	— Acid. Phosphor. Dil.	— 3 pts. in 20	2 to 5 mins. 10 to 30 mins.	Refrigerant and astringent. Used to allay thirst in diabetes; in sweating, hæmorrhages, and in the phosphatic diathesis. Employed in making the officinal phosphates.

The Acids (*continued*).

Acid.	B. P. Preps.	Strength.	Dose.	Action and Use.
Acidum Salicylicum	—	—	5 to 30 grs.	Antiseptic. Is useful in acute articular rheumatism; is used in the preparation of Salicylate of Sodium.
Salicylic Acid $HC_7H_5O_3=138$	Ung. Acidi. Salicylici	1 pt. in 27	—	
Acidum Sulphuricum	—	—	—	The strong acid is a powerful caustic. Used in preparation of the officinal sulphates. The dilute acid is refrigerant, tonic, and astringent, and is used in thirst, in sweating, diarrhœa, mucous discharges, hæmorrhages; in debility, phosphatic diathesis, chronic skin diseases, and low states of the system. It enters into the Inf. Rosæ Acidum. The Acid. Sulph. Aromat. is contained in Infus. Cinchon. Acidum.
Sulphuric Acid, "Oil of Vitriol"	Acid. Sulph. Aromaticum	—	5 to 30 mins.	
$H_2SO_4=98$	Acid. Sulph. Dil.	1 min. strong acid in 12 mins.	Ditto.	
Acidum Sulphurosum Sulphurous Acid $SO_2=64$	—	5 per cent. by weight	30 to 60 mins.	In dyspepsia and vomiting. Destroys low forms of vegetable life. Locally, is used in parasitic skin diseases, and as a spray in ulcerative stomatitis, and as an antiseptic application. Is employed in the preparation of Sodii Sulphis.
Acidum Tannicum	—	—	2 to 10 grs.	Styptic and astringent in hæmorrhages, diarrhœa, dysentery, and mucous discharges.
Tannic Acid $C_{27}H_{22}O_{17}=558$	Glycerinum Acidi Tannici	1 pt. in 6 by weight	10 to 40 mins.	
	Suppos. Acidi Tannici	3 grs. in each	—	Useful in leucorrhœa.
	Suppos. Acidi Tannici cum Sapone	3 grs. in each	—	Ditto.
	Trochisci Acidi Tannici	½ gr. in each	—	Astringent
Acidum Tartaricum Tartaric Acid $H_2C_4H_4O_6=150$	—	—	10 to 30 grs.	Refrigerant. Enters into formation of the officinal tartrates.

PREPARATION.

In the preparation of ten of the twenty-one acids Sulphuric acid is an important factor.

Acidum Sulphuricum.

Is made by burning sulphur, to form sulphurous anhydride; this is passed into leaden chambers, where it meets steam and nitrous fumes obtained by the action of sulphuric acid on nitre; from the nitrous fumes the sulphurous anhydride takes up oxygen, becoming converted into sulphuric anhydride, which unites with the water to form sulphuric acid, thus:

$$SO_2 + H_2O + N_2O_3 = H_2SO_4 + 2NO.$$

The nitric oxide (NO) takes up oxygen in its turn from the air, becoming converted into the peroxide (NO_2), which is again reduced by fresh sulphurous anhydride to nitric oxide.

$$SO_2 + NO_2 + H_2O = H_2SO_4 + NO.$$

The nitric oxide thus acts as a carrier of oxygen from the air to the sulphurous anhydride. When the liquid sulphuric acid at the bottom of the chamber attains a density of 1·5, beyond which it absorbs nitrous fumes, it is drawn off and evaporated in shallow leaden pans to a sp. gr. of 1·72; it is finally concentrated in glass or platinum retorts to a sp. gr. of 1·84.

Acidum Sulphurosum.

Is obtained by deoxidizing sulphuric acid by distilling it with wood charcoal. Four oz. of sulphuric acid and 1 oz. of charcoal are put into a glass flask and heated. The resulting sulphurous anhydride is first passed through a wash-bottle, to free it from carbonic anhydride and sulphuric acid, and is then conducted into a receiver filled with distilled water, which must be kept cool.

$$C + 2H_2SO_4 = 2H_2O + CO_2 + 2SO_2.$$

The sulphurous anhydride combines with the water to form the acid (H_2SO_3).

Glacial Acetic acid, Hydrochloric acid, Hydrocyanic acid, and Nitric acid, being volatile, are prepared by distilling one of their salts with the more fixed sulphuric acid.

Acidum Aceticum Glaciale.

Is prepared by carefully heating acetate of sodium, so as to drive off the water of crystallisation; the salt is then distilled with sulphuric acid:—

$$2NaC_2H_3O_2+H_2SO_4=Na_2SO_4+H_2O+C_4H_6O_3.$$

Should the product contain sulphurous acid, it must be shaken with bichromate of potash or black oxide of manganese, and redistilled; sulphurous acid is thus converted into sulphuric acid, which combines with the black oxide of manganese.

Acidum Hydrochloricum.

Sulphuric acid (44 oz.) is slowly added to water (32 oz.) in a glass flask; the liquid is then allowed to cool before adding chloride of sodium (48 oz.), to prevent the too rapid evolution of gas. Heat is now applied, and as the gas is given off it is passed through a wash-bottle to remove any trace of sulphuric acid; it is then conducted into a receiver containing distilled water (50 oz.) This must be kept cool during the whole process, because as the water becomes saturated its temperature increases and its power of absorption lessens. The process is to be continued until the product measures 66 oz., or the liquid has acquired a sp. gr. of 1·16:—

$$NaCl+H_2SO_4=HCl+NaHSO_4.$$

Acidum Hydrocyanicum Dilutum.

Mix in a retort an ounce of sulphuric acid with four ounces of water; to the mixture when cool add two and a quarter ounces of ferrocyanide of potassium dissolved in half a pint of water; adapt to the retort a receiver containing eight ounces of water, which must be kept cool. Distil with a gentle heat until the fluid in the receiver measures seventeen ounces. Lastly, add as much water as will bring the acid up to the required strength (2 per cent.), so that 100 grains of it precipitated with solution of nitrate of silver shall yield 10 grains of dry cyanide of silver. Ten grains of AgCy (molecular weight = 134), derived from 100 grains of HCy (mol. wt. = 27, just one-fifth of 134), correspond to 2 grains of the pure liquid acid—*i.e.*, one-fifth the weight of the cyanide. The following is the reaction occurring in the preparation :—

$$2K_4FeCy_6 + 6H_2SO_4 = \underbrace{K_2Fe_2Cy_6}_{\text{Everitt's Salt.}} + 6KHSO_4 + 6HCy.$$

Excess of sulphuric acid should be avoided in the process lest formic acid be produced.

Acidum Nitricum.

Heat equal weights of sulphuric acid and nitrate of potassium in a glass retort, and collect the liberated nitric acid by means of a Liebig's condenser.

$$KNO_3 + H_2SO_4 = HNO_3 + KHSO_4.$$

Citric and Tartaric acids are obtained by precipitation as insoluble salts, and then liberated by sulphuric acid.

Acidum Citricum.

Four pints of lemon-juice are boiled, so as to coagulate albuminous matter; chalk is then added by degrees until effervescence ceases; citrate of calcium is thus formed and is precipitated :—

$$2H_3C_6H_5O_7 + 3CaCO_3 = Ca_32C_6H_5O_7 + 3H_2O + 3CO_2.$$

Collect the deposit of citrate of calcium on a filter, and wash with *hot* water until the filtrate is colourless; if cold water were employed the precipitate would be dissolved. The object of the washing is to remove all traces of sugar and malate of lime which may be present. Mix the deposit with one pint of distilled water, and add gradually two and a half ounces of sulphuric acid, previously diluted with a pint and a half of distilled water; boil gently for an hour, constantly stirring. Sulphate of calcium is thus formed and precipitated, and the liberated citric acid is held in solution:—

$$Ca_3 2C_6H_5O_7 + 3H_2SO_4 = 3CaSO_4 + 2H_3C_6H_5O_7.$$

Filter and wash the insoluble matter with distilled water, and add the washings to the solution. Concentrate the solution to a density of 1·21; allow it to cool, and after twenty-four hours decant it from the crystals of sulphate of calcium which will have formed; further concentrate the liquor until a film forms on its surface, and set aside to cool and crystallise. Purify, if necessary, by recrystallisation. Good lemon-juice yields from 2½ up to 10 per cent. of pure acid. The amount of citric acid in lemons decreases on keeping.

Acidum Tartaricum.

Boil 45 ounces of acid tartrate of potassium with 2 gallons of water, and add gradually 12½ ounces of prepared chalk, constantly stirring; part of the acid tartrate of potassium is thus converted into neutral tartrate, and tartrate of calcium is also formed:—

$$2KHC_4H_4O_6 + CaCO_3 = CaC_4H_4O_6 + K_2C_4H_4O_6 + CO_2 + H_2O.$$

When effervescence has ceased, add 13½ ounces of chloride of calcium dissolved in 2 pints of water; the neutral tartrate of potassium is thus converted into tartrate of calcium:—

$$K_2C_4H_4O_6 + CaCl_2 = CaC_4H_4O_6 + 2KCl.$$

When the tartrate of calcium has subsided, pour off the liquid and wash the tartrate with distilled water until it is rendered tasteless. Pour 13 fluid ounces of sulphuric acid, first diluted with 3 pints of water, on the tartrate of calcium; mix thoroughly; boil for half an hour, with repeated stirring, and filter through calico. Sulphate of calcium is thus formed, and is precipitated, the liberated acid being held in solution :—

$$CaC_4H_4O_6+H_2SO_4=H_2C_4H_4O_6+CaSO_4.$$

Evaporate the filtrate at a gentle heat until it acquires a sp. gr. of 1·21; allow to cool, and then separate and reject the crystals of sulphate of lime which may form. Again evaporate the clear liquor till a film forms on the surface, and allow it to cool and crystallise. Lastly, purify the crystals by solution, filtration if necessary, and recrystallisation.

Two of the acids—namely, Acetic and Carbolic—are made by a process of destructive distillation.

Acidum Aceticum.

Wood is heated to a low redness in iron retorts, and acetic acid, mixed with wood spirit, tar, and various hydrocarbons distils over; this crude pyroligneous fluid is then decanted from the tar and redistilled; the wood spirit comes over first and then the acetic acid; the latter is neutralised with carbonate of sodium. The resulting acetate of sodium is purified by several recrystallisations, and is finally distilled with sulphuric acid and water. Sulphurous acid, if formed, is removed in the same manner as in the case of glacial acetic acid.

Acidum Carbolicum.

Is obtained by fractional distillation from coal-tar, and subsequent purification. The heavier coal-tar oils, boiling between 300° and 450°, are treated by a solution of soda, or by milk of lime. The resulting compounds are then decomposed by a mineral acid, and the oily liquid so obtained is rectified.

Two of the acids—namely, Arsenious and Benzoic—are obtained by sublimation from their natural compounds.

Acidum Arseniosum.

Is collected in flues during the smelting of arseniurets, chiefly arsenical cobalt and mispickel (FeSAs); it is afterwards purified by heating in a thin porcelain capsule, covered with a glass flask filled with cold water; the arsenious acid rises in a vapour and condenses on the bottom of the flask.

Acidum Benzoicum.

Is prepared by heating gum benzoin in a shallow iron pot, surmounted by a wooden or pasteboard box, a piece of muslin being interposed to prevent the sublimed acid from falling back into the pot. Many methods for the artificial preparation of benzoic acid are known.

One acid is prepared by solution from its natural compound, namely—

Acidum Tannicum.

The following is the Pharmacopœial process, and was devised by Leconnet. Expose powdered galls to a damp atmosphere for two or three days, and afterwards add sufficient ether to form a soft paste. Let this stand in a well-closed vessel for twenty-four hours; then, having quickly enveloped it in a linen cloth, submit it to strong pressure in a suitable press, so as to separate the liquid portion. Reduce the pressed cake to powder, mix it with sufficient ether, to which one-sixteenth of its bulk of water has been added, to form again a soft paste, and press this as before. Mix the expressed liquids, and expose the mixture to spontaneous evaporation until, by the aid subsequently of a little heat, it has acquired the consistence of a soft extract; then place it on earthen plates or dishes, and dry it in a hot air chamber at a temperature not exceeding 212°.

The ether, water, and tannic acid seem to unite to form a triple soluble compound, which is decomposed on evaporation and deposits the tannic acid in the amorphous form. Tannic acid is insoluble in pure ether.

Two other acids, Gallic and Phosphoric, are prepared by a process of Oxidation.

Acidum Gallicum.

This acid is now prepared by boiling one part of galls in a coarse powder, in four fluid parts of dilute sulphuric acid for half an hour. The product should then be strained through calico while still hot, and the crystals, which separate on cooling, collected. Decolorisation is effected by means of animal charcoal, and the acid is then purified by repeated recrystallisation.

This acid was formerly ordered to be prepared by keeping the powdered galls made into a paste, in a temperature of 60° to 70° F. for six weeks.

Acidum Phosphoricum Concentratum.

Put six ounces of nitric acid, diluted with eight ounces of distilled water, into a tubulated retort connected with a Liebig's condenser, and having added 413 grains of phosphorus, apply a gentle heat so as slowly to distil five fluid ounces of the liquid. Return this to the retort, and continue the distillation, occasionally returning the distillate, until the phosphorus has entirely disappeared. Transfer the contents of the retort to a porcelain dish of hard, well-enamelled ware, and evaporate the liquid until it is reduced to four fluid ounces; then, transferring it to a platinum vessel, continue the evaporation until it is reduced to about two fluid ounces, and orange-coloured vapours are no longer formed. Mix it now with distilled water until, when cold, it measures three fluid ounces.

The following equation represents the reaction occurring in the above process:—

$$3P + 5HNO_3 + 2H_2O = 3H_3PO_4 + 5NO.$$

The nitric acid is first diluted, to avoid the explosive ignition of the phosphorus.

Boric and Chromic acids are precipitated from solutions of their salts by means of sulphuric acid.

Acidum Boricum.

This acid is precipitated from a hot solution of borax ($Na_2B_4O_7$) by the addition of sulphuric acid. The crystals are then separated and dried.

It is also obtained by the purification of native boric acid.

Acidum Chromicum.

Thirty oz. of bichromate of potassium are dissolved in 50 fluid oz. of water and 42 fluid oz. of sulphuric acid. The liquid is then set aside for twelve hours to allow of the formation of crystals of acid sulphate of potassium. It is then decanted off and heated to 185° F., 15 more ounces of acid being added with sufficient water to redissolve any crystals of chromic acid that may have been formed. The mixture is allowed to cool, and the crystals are collected and dried on porous tiles at a temperature not exceeding 100° F. More crystals may be obtained from the mother liquid. It is an anhydride, and therefore not a true acid.

The remaining five acids are obtained as follows:

Acidum Hydrobromicum.

One oz. of bromine is dissolved in 15 oz. of water in a glass receptacle. Sulphuretted hydrogen is then passed through the solution until the red colour disappears, and the liquid is then filtered and distilled. The distillate is rejected so long as the odour of sulphuretted compounds is perceptible, and when free from this it is collected until sulphuric acid begins to distil over. The distillate is then diluted until its sp. gr. at 60° F. is 1·007. It must be kept in well-stoppered bottles.

Acidum Lacticum.

It is produced by the action of a peculiar ferment on sugar, the resulting product being purified for use.

Acidum Oleicum.

This fluid fatty acid is obtained by the action of superheated steam on fats, with subsequent separation from solid fats by pressure. It may also be prepared by the process of saponification.

Acidum Salicylicum.

Is now prepared by passing a current of carbonic acid gas (CO_2) through a mixture of carbolic acid and caustic soda at a high temperature. The resulting salicylate of sodium is then decomposed by means of an acid, and the product purified.

Acidum Meconicum.

A concentrated infusion of opium is neutralised by ammonia, and a solution of chloride of calcium is added, meconate of calcium being precipitated. The precipitate is washed and placed in a small quantity of hot water and a little hydrochloric acid. The clear liquid, filtered if necessary, deposits crystals of meconic acid on cooling.

CHARACTERS AND TESTS.

Acidum Aceticum.

Contains 33 per cent. of real acid. It is a colourless liquid, having a strong acid reaction and a pungent agreeable odour; a tarry odour indicates the presence of empyreumatic oil. Sp. gr. 1·044. 182 grains by weight, containing 60 grains of real acetic acid, require for neutralisation 1,000 grain-measures of the volumetric solution of soda. It is volatile, and on evaporation should leave no residue, showing the absence of fixed impurities. It should give no precipitate with H_2S (absence of metallic impurities), with $BaCl_2$ (absence of sulphuric acid), or with $AgNO_3$ (absence of hydrochloric acid). If a fluid drachm of it, mixed with half an ounce of distilled water and half a drachm of pure hydrochloric acid, be put into a small flask with a few pieces of granulated zinc, and while effervescence continues a slip of bibulous paper wetted with solution of subacetate of lead be suspended in the upper part of the flask above the liquid for about five minutes, the paper will not be discoloured (absence of sulphurous acid). In this test hydrogen gas is developed by the zinc and hydrochloric acid :—

$$Zn + 2HCl = ZnCl_2 + H_2.$$

If this meets with sulphurous acid it forms sulphuretted hydrogen :—

$$SO_2 + 3H_2 = 2H_2O + H_2S;$$

the latter forms with lead a black sulphide of lead, and hence will discolour lead paper.

Acidum Aceticum Glaciale.

Contains 99 per cent. of real acid. It crystallises in colourless prismatic crystals when cooled to 34°, and remains crystalline until the temperature is raised to above 60° F. Its sp. gr. is 1·058, and this is increased by adding 10 per cent. of water; hence density cannot be relied on as a test of the strength of glacial acetic acid; further dilution beyond 10 per cent. permanently lowers the sp. gr. At the mean temperature of the air glacial acetic acid is a colourless fluid; it has a pungent acetous odour. Sixty grains by weight, mixed with 1 oz. of distilled water, require for neutralisation at least 990 grain-measures of the volumetric solution of soda. Glacial acetic acid is directed to be tested for sulphurous acid in the same way as acetic acid.

Acidum Arseniosum.

When freshly prepared is transparent and vitreous or glass-like; after a time it becomes opaque, and resembles porcelain; its density diminishes, and it becomes more soluble. The medicinal acid occurs as a heavy white powder, or in sublimed masses which usually present a stratified appearance caused by the existence of separate layers differing from each other in degrees of opacity. The sp. gr. of the opaque anhydride is 3·699, that of the vitreous is 3·738. It is tasteless, but leaves a faint sweetish after-impression. When slowly sublimed in a glass tube it forms minute, brilliant, and transparent octahedral crystals; it sometimes crystallises in prisms with a rhombic base, and hence is dimorphous. It is soluble in about 100 parts of cold water, but is much more soluble in boiling water; the solution in boiling water deposits octahedral crystals on cooling. Prolonged boiling converts the opaque into the vitreous variety. Arsenious acid is slightly soluble in alcohol. The aqueous solution, acidified, gives a yellow precipitate with sulphuretted hydrogen; with ammonio-nitrate of silver, it gives a canary-yellow precipitate, which is insoluble in water, but readily dissolved by ammonia and by nitric acid (*Hume's test*); with ammonio-sulphate of copper, it gives a green precipitate.

Marsh's Test.—Place the solution to be tested in an apparatus for the generation of hydrogen. Generate hydrogen by the action of a hot solution of caustic potash or soda on zinc:—

$$Zn + 2KHO = K_2ZnO_2 + H_2.$$

Fleitmann has shown that antimony will not combine with this form of hydrogen, but that arsenic will. If arsenic be present it combines with the nascent hydrogen, forming arseniuretted hydrogen:—

$$As_2O_3 + 6H_2 = 3H_2O + 2AsH_3.$$

On igniting the jet of gas, and holding over the flame a cold porcelain plate, a brown spot of arsenic will be deposited, the hydrogen being burned off into water.

Reinsch's Test.—Boil a strip of pure copper in the solution, acidified with pure hydrochloric acid; arsenic, if present, will be deposited on the copper. Dry the latter, and heat it gently in a long narrow test-tube; the arsenic volatilises, and becomes oxidised to As_2O_3, which condenses on the cool part of the tube in characteristic octahedral crystals.

Arsenious acid has no odour, but when sprinkled on a red-hot coal it emits an alliaceous odour owing to its reduction by the carbon. Arsenious acid is entirely volatilised, without fusing, at a temperature not exceeding 400°, showing the absence of gypsum and chalk. Minute portions heated in a test-tube with a little acetate of sodium develop the odour of kakodyl. Four grains of it, dissolved in boiling water with 20 grains of bicarbonate of sodium, discharge the colour of 808 grain-measures of the volumetric solution of iodine.

Acidum Benzoicum.

Occurs in light, feathery, flexible, crystalline plates and needles, colourless and with a pearly lustre when pure, but sometimes brownish, owing to the presence of oily matter; it has an agreeable odour like benzoin, owing to impregnation with volatile oil, the pure acid being odourless. Sparingly soluble in water, but more soluble in hot than in cold water; the addition of phosphate of sodium or of borax increases its solubility. It is readily dissolved by rectified spirit, and it is soluble also in fixed oils. Its aqueous solution reddens litmus, but its acid powers are feeble. It forms soluble benzoates with lime and the alkalies, but any more soluble acid, such as hydrochloric, will precipitate the benzoic acid, except from very dilute solutions. Neutral benzoates give a bulky reddish precipitate of ferric benzoate with persalts of iron.

Benzoic acid melts at 248°, and boils at 462°; when heated to the last-named temperature, it passes off in vapour, leaving only a slight residue, showing the absence of fixed impurities, as lime or asbestos. Its vapours are acrid and suffocating. Kindled in the open air, it burns with a smoky flame.

Acidum Boricum.

Colourless, pearly, lamellar crystals, or irregular masses of crystals, easily powdered, unctuous to the touch; taste slightly sour and bitter with sweetish after-flavour. Soluble in 25 parts of water, 5 of glycerine, 16 of rectified spirit, at 60° F. It changes the colour of litmus to wine-red ; turmeric paper moistened with an aqueous solution slightly acidified with hydrochloric acid, becomes brownish-red on gently drying, and this colour is tinged with green on the addition of a solution of caustic potash. The alcoholic solution burns with a green flame. Aqueous solutions should not yield more than a faint opalescence with chloride of barium, nitrate of silver, or oxalate of ammonium ; nor any precipitate with sulphydrate of ammonium ; nor a strong persistent yellow tinge to the flame of a spirit-lamp or Bunsen's burner.

Acidum Carbolicum.

In colourless acicular crystals, which at a temperature of 95° become an oily liquid, having a strong odour and taste resembling, but more offensive than creasote, which it also resembles in many of its characters and properties. The sp. gr. of carbolic acid is 1·065 at melting-point, which should not be lower than 91·5° F. ; boiling-point 370°. The crystals readily absorb moisture on exposure to air, and are thus liquefied ; the acid, however, is but slightly soluble in water, but is freely soluble in alcohol, ether, glycerine, and glacial acetic acid. By agitating four parts of carbolic acid with one of water at a low temperature, a hydrate is formed, which crystallises in six-sided prisms. Carbolic acid does not redden litmus paper dipped into it. A slip of deal dipped into it, and afterwards into hydrochloric acid, and then allowed to dry in the air, acquires a greenish-blue colour. It coagulates albumen and collodion. Carbolic acid does not affect the plane of polarisation of a ray of polarised light ; wood-creasote, on the other hand, is dextro-gyrate. Carbolic acid belongs to a series of bodies termed *Phenols*, which, though having the composition of alcohols and several properties of acids, differ essentially from these classes of substances. Heated with ammonia in a sealed test-tube, it is converted into water and aniline :—

$$C_6H_6O + NH_3 = C_6H_5H_2N + H_2O.$$

Sulphuric acid dissolves it, forming with it sulphocarbolic acid ($HC_6H_5SO_4$), which forms sulphocarbolates with soda, zinc, and other bases. Nitric acid decomposes it with violence, forming *Trinitrophenic* or *Carbazotic acid* ($HC_6H_2(NO_2)_3O$), *Dinitrophenic acid* ($HC_6H_3(NO_2)_2O$), and *Nitrophenic acid* ($HC_6H_4NO_2O$). Dry carbonic anhydride, passed through the dry powder of phenol-sodium, between 212° and 482°, forms among other compounds salicylate of sodium, which is decomposed by hydrochloric acid into salicylic acid and chloride of sodium.

Acidum Chromicum.

This anhydride occurs in crimson acicular crystals, which are exceedingly deliquescent, inodorous, and caustic to the skin. At a high temperature it melts, and at a still higher temperature decomposes with the evolution of oxygen gas, leaving a greenish-black residue. Warmed with hydrochloric acid, chlorine is evolved. Mixed with cold alcohol, aldehyd is given off and a green residue remains. It is soluble in water, yielding a deep orange-red solution. If placed in contact with alcohol, glycerine, and certain other organic matters, sudden combustion or explosion may ensue. One or 2 grains dissolved in 2 or 3 oz. of water, should afford only a faint opalescence with chloride of barium.

Acidum Citricum.

Large transparent colourless crystals of an agreeable acid taste, decomposed by heat, soluble in three-fourths of their weight of cold water. A solution containing 34 grains of the acid to the ounce of water resembles lemon-juice in strength; it becomes mouldy by keeping, and decomposes into carbonic and acetic acids. Citric acid dissolves zinc and iron, with evolution of hydrogen. It is very readily oxidised, nitric acids and other agents converting it, at the ordinary temperature, into acetic, oxalic, and carbonic acids. Its aqueous solution is not darkened by sulphuretted hydrogen (absence of metallic impurities, chiefly lead). It gives no precipitate when added in excess to solution of acetate of potassium (absence of tartaric acid). It causes no precipitate with any salt of potassium except the tartrate, from which it throws down the acid tartrate of that base. It should give no precipitate with solution of chloride of barium (absence of sulphates); and, if sparingly added to cold lime-water, it should not render it turbid (absence of oxalic acid); hot lime-water would give with it a precipitate of citrate of calcium. Citrate of calcium is not dissolved by cold solution of potash, but tartrate of calcium is; hence, citrates can thus be separated from tartrates. Crystals of citric acid should leave no ash when burned with free access of air (absence of fixed impurities—*e.g.*, lime). Seventy grains of the acid dissolved in distilled water are neutralised by 1,000 grain-measures of the volumetric solution of soda.

Acidum Gallicum.

Crystalline, in acicular prisms or silky needles, sometimes nearly white, but generally of a pale fawn-colour. Taste, sweetish and astringent, but less so than tannic acid, owing to its slight solubility in the saliva. It requires about 100 parts of cold water for its solution, but it dissolves in 3 parts of boiling water; it is soluble also in rectified spirit, and glycerine makes with it a clear solution miscible with water; ether dissolves it imperfectly. The aqueous solution gives no precipitate with solution of isinglass, unless when mixed with gum, nor does it precipitate albumen or alkaloids, thus differing from tannic acid. It gives a bluish-black precipitate with persalts of iron, and this disappears on heating, owing to the formation of metagallic acid; protosalts of iron are also gradually blackened by gallic acid. The crystalline acid, when dried at 212°, loses 9·5 per cent. of its weight (= its molecule of water of crystallisation). It is decomposed by a heat of 410° into *Pyrogallic acid* ($C_6H_6O_3$) and carbonic acid. Pyrogallic acid gives a red colour with persalts of iron, and a deep blue with protosalts. Gallic acid should leave no residue when burned with free access of air.

Acidum Hydrobromicum Dilutum.

A colourless and inodorous liquid, with a sour taste and acid reaction. It should leave little or no residue when evaporated to dryness. Chlorine water liberates bromine, which turns the liquid yellow. With nitrate of silver it yields a white curdy precipitate insoluble in nitric acid, and only sparingly soluble in a solution of ammonia. Does not discolour on keeping, and should give no precipitate with chloride of barium (absence of sulphates). 810 grains by weight require for neutralisation 1,000 grain-measures of the volumetric solution of soda.

Acidum Hydrochloricum.

The pure acid is a colourless liquid, but the commercial acid is yellowish, owing to the presence of some organic matter, or of chloride of iron derived from the iron stills in which it is prepared. It is strongly acid, emitting white vapours on exposure, owing to the union of the acid gas with the moisture in the air; it has a pungent odour; sp. gr. 1·16. When evaporated to dryness, it should leave no residue (absence of fixed impurities). It gives with nitrate of silver a curdy white precipitate of chloride of silver, soluble in excess of ammonia, but insoluble in nitric acid, and which turns violet on exposure to light. 114·8 grains by weight, mixed with ½ oz. of distilled water, require for neutralisation 1,000 grain-measures of the volumetric solution of soda, indicating the percentage of the gas which the acid should include. When diluted with four times its volume of distilled water, it should give no precipitate with chloride of barium (absence of sulphates), or with sulphuretted hydrogen (absence of metallic impurities, as iron or lead); it should not tarnish or alter the colour of bright copper when boiled in it (absence of arsenic or antimony). Hydrochloric acid is directed to be tested for sulphurous acid in the same manner as are acetic and glacial acetic acids (p. 14). Hydrochloric acid should have no action on gold-leaf, and should not decolourise solution of sulphate of indigo (absence of nitric acid and of free chlorine). Iron is detected by diluting the acid, neutralising with carbonate of sodium, and adding ferrocyanide of potassium, when, if it be present, Prussian blue will be precipitated.

Acidum Hydrocyanicum Dilutum.

A colourless liquid, with a taste which is at first cooling and afterwards irritating, and an odour resembling that of laurel-water; sp. gr. 0·997. Being volatile, and having but a very slight acid reaction, it only transiently reddens litmus paper. A fluid drachm evaporated in a platinum-dish leaves no residue. Treated with a minute quantity of a mixed solution of sulphate and persulphate of iron, afterwards with potash, and finally acidulated with hydrochloric acid, it forms Prussian blue. With nitrate of silver, hydrocyanic acid gives a white precipitate of cyanide of silver, which is entirely soluble in boiling concentrated nitric acid. It should give no precipitate with solution of chloride of barium (absence of sulphuric acid). The absence of any foreign acid is determined by the fact of a red colour not being produced on adding iodocyanide of potassium and mercury (Geoghegan's test). It should not be coloured by sulphuretted hydrogen (absence of metallic impurities). 270 grains of prussic acid, rendered alkaline by the addition of solution of soda, require 1,000 grain-measures of the volumetric solution of nitrate of silver to be added before a permanent precipitate begins to form, which corresponds to 2 per cent. of the real acid. In this test the nitrate of silver forms with the cyanide of sodium a soluble double cyanide of silver and sodium :—

$$(1.)\ 2NaCy + AgNO_3 = AgCyNaCy + NaNO_3.$$

When all the cyanide of sodium is converted into the double cyanide, any further addition of the solution of nitrate of silver will cause a permanent precipitate of cyanide of silver :—

$$(2.)\ AgCyNaCy + AgNO_3 = 2AgCy + NaNO_3.$$

Scheele's prussic acid contains 4 per cent. of the real acid.

Anhydrous hydrocyanic acid is colourless, with a more intense odour than the dilute. Its sp. gr. is 0·697. It is very volatile, and rapidly decomposes into a carbonaceous-like matter. The dilute acid is liable to decomposition on exposure to light, and hence is generally kept in blue glass bottles. The presence of a trace of a mineral acid, sulphuric or nitric, is said to act as a preservative.

Acidum Lacticum.

A colourless, syrupy liquid, inodorous, and with an acid taste and reaction; sp. gr. 1·21. Miscible in all proportions with water, alcohol, and ether; nearly insoluble in chloroform. Warmed with permanganate of potassium, it gives the odour of aldehyd. A solution in 10 parts of water, neutralised by ammonia, is not precipitated by sulphydrate of ammonium. Not more than a faint opalescence is produced with chloride of barium, nitrate of silver, or oxalate of ammonium; nor when boiled with excess of Fehling's solution is any precipitate formed. 120 grains require for neutralisation 1,000 grain-measures of volumetric solution of soda.

Acidum Meconicum.

Almost colourless, micaceous crystals, sparingly soluble in water, but readily in alcohol, with strongly acid taste and reaction. It is coloured red by neutral solution of perchloride of iron, the colour being discharged by strong, but not by diluted, hydrochloric acid. No precipitate with solution of iodine and iodide of potassium.

Acidum Nitricum.

The pure acid is a colourless liquid, but the commercial acid is reddish or yellowish, owing to its containing some nitric peroxide (NO_2). Exposed to the air, it emits acrid corrosive fumes, caused by the combination of the acid gas with the moisture of the air. Its sp. gr. is 1·42; if denser than this, it is unstable, and is constantly undergoing decomposition under the influence of light. When poured on copper filings, nitric acid forms dense red fumes; but if the acid be mixed with an equal volume of water, and then added to the copper, it gives off a colourless gas (NO), which acquires an orange-red vapour (NO_2) as it mixes with the air, and which, if it be introduced into a solution of sulphate of iron, communicates to it a purple or brown colour. The boiling-point of the acid is 250° F. If submitted to distillation, the product continues uniform throughout the process, indicative of correct percentage of acid present. It leaves no residue on evaporation (absence of fixed impurities). Diluted with six times its volume of distilled water, it should give no precipitate with solution of chloride of barium (absence of sulphuric acid), or with solution of nitrate of silver (absence of hydrochloric acid). Ninety grains by weight of it mixed with half an ounce of distilled water require for neutralisation 1,000 grain-measures of the volumetric solution of soda, indicating the presence of 70 per cent. by weight of nitric acid (HNO_3), corresponding to 60 per cent. of anhydrous nitric acid (N_2O_5).

Acidum Oleicum.

A straw-coloured liquid, with scarcely any smell or taste, and but a faintly acid reaction. It becomes brown and more markedly acid on exposure to the air; sp. gr. ·860 to ·890. Insoluble in water, but readily soluble in alcohol, chloroform, and ether. At 40° to 41° F. it becomes semi-solid, melting again at 56° to 60°. Warmed with carbonate of potassium, it should be completely saponified; and an aqueous solution of this salt, neutralised by acetic acid and treated with acetate of lead, should yield a precipitate which, after washing in boiling water, is almost entirely soluble in ether.

Acidum Phosphoricum Concentratum.

A colourless, syrupy liquid, with a sour taste and strongly acid reaction; sp. gr. 1·5. With ammonio-nitrate of silver it gives a canary-yellow precipitate, which is soluble in ammonia and in dilute nitric acid. All soluble phosphates give with sulphate of magnesium, on adding chloride of ammonium and solution of ammonia, a white crystalline precipitate of ammonio-magnesian phosphate or "triple phosphate" ($MgNH_4PO_4$). Phosphoric acid, when diluted, should not give a precipitate with sulphuretted hydrogen (absence of metallic impurities), with chloride of barium (absence of sulphuric acid), or with nitrate of silver acidulated with nitric acid (absence of hydrochloric acid). It does not give a precipitate with solution of albumen, showing that metaphosphoric acid is not present. When mixed with an equal volume of pure sulphuric acid, and then introduced into solution of sulphate of iron, it should not communicate to it a dark colour (absence of nitric acid). Mixed with an equal volume of solution of perchloride of mercury and heated, no precipitate is formed, showing the absence of phosphorous acid. If any were present, calomel would be deposited:—

$$2HgCl_2 + H_3PO_3 + H_2O = 2HgCl + 2HCl + H_3PO_4.$$

The strength of phosphoric acid cannot be tested by the volumetric solution of soda, as the phosphate of sodium which is formed, having an alkaline reaction, interferes with the observation of the point of neutralisation as evidenced by litmus-paper. It is therefore estimated gravimetrically. 73·8 grains by weight poured upon 180 grains of oxide of lead in fine powder leave by evaporation a residue (principally phosphate of lead), which, after it has been heated to dull redness, weighs 215·5 grains.

Acidum Salicylicum.

White acicular crystals, inodorous, taste at first sweet, but becoming acid. Soluble in about 500 parts of cold water, and more readily in hot water, alcohol, and ether. The crystals melt at 311° Fahr., and below 392° Fahr. volatilise without decomposition. The aqueous solution gives a reddish violet colour with a solution of perchloride of iron. An alcoholic solution allowed to evaporate spontaneously should leave a perfectly white residue.

Acidum Sulphuricum.

When pure, a colourless, oily-looking liquid, intensely acid and corrosive. It chars most vegetable substances, and becomes darkened. Some bodies dissolve in sulphuric acid without blackening, as indigo ; others are not blackened, but are decomposed, as oxalic acid, etc. The sp. gr. of the officinal acid is 1·843. It absorbs water rapidly, and when mixed with it evolves much heat. On dilution with an equal measure of water, it generally gives a slight white precipitate of sulphate of lead (derived from the leaden chambers in which it is prepared). Dilute sulphuric acid gives a copious precipitate with chloride of barium, which is insoluble in acids. Evaporated in a platinum-dish, it should leave little or no residue (absence of fixed salts). When a solution of sulphate of iron is carefully poured over its surface, there should be no purple colour developed where the two liquids meet (absence of nitric acid). Diluted with six times its volume of distilled water, it should give no precipitate with sulphuretted hydrogen (absence of arsenic, which is liable to be present when certain varieties of sulphur, as Brazillian, are used in the preparation of the acid). Fifty grains by weight, mixed with one ounce of distilled water, require for neutralisation 1,000 grain-measures of the volumetric solution of soda.

Acidum Sulphurosum.

A colourless liquid, with a pungent sulphurous odour; it contains 5 per cent. (by weight) of sulphurous anhydride (SO_2); sp. gr., 1·025. Sulphurous acid is a powerful bleaching and deoxydising agent. It should give no precipitate, or a very slight one, with chloride of barium (absence of sulphuric acid); but it gives a copious one of sulphate of barium if solution of chlorine be also added, the chlorine converting the sulphurous into sulphuric acid. When evaporated, it should leave no residue (absence of fixed impurities). Sixty-four grains by weight, mixed with one pint of distilled water and a little mucilage of starch, do not acquire a permanent blue colour with the volumetric solution of iodine until 1,000 grain-measures of the latter have been added.

Acidum Tannicum.

Occurs in pale-yellow vesicular masses or thin glistening scales, and is uncrystallisable. It has a strongly astringent taste, and a slightly acid reaction. It is readily soluble in water, rectified spirit, and glycerine, but very sparingly soluble in ether, especially when anhydrous; it is insoluble in fixed and volatile oils. The aqueous solution precipitates gelatine yellowish-white, and it is thus distinguished from gallic acid. With the persalts of iron it gives a bluish-black colour of tannate of iron. Some varieties of tannin, however, as that in catechu, give a dark-green precipitate with ferric salts; while others, as that in rhatany, give a grey precipitate. With salts of lead and antimony tannic acid gives white insoluble precipitates of tannates of these metals. It decomposes carbonates of the alkali metals with effervescence, forming soluble tannates, which do not precipitate gelatine. The aqueous solution of tannic acid and solutions of the tannates of the alkalies gradually become mouldy and brown, absorbing oxygen, which converts tannic into gallic acid. This is due, according to M. Robiquet, to the presence of a vegetable ferment, pectase, which exists in galls; and it is said that if the solution of tannic acid be boiled for some time, so as to coagulate the pectase, it may be kept for an indefinite period without change. Nitric acid converts tannic acid into oxalic and saccharic acids. When boiled with dilute hydrochloric or sulphuric acid, tannic acid unites with water, and is converted into glucose and gallic acid:—

$$C_{27}H_{22}O_{17} + 4H_2O = C_6H_{12}O_6 + 3H_3C_7H_3O_5.$$

A concentrated boiling solution of potash has the same effect. Hence it is termed a glucoside; but Schiff considers tannic to be merely the anhydride of gallic acid. At 620° it is decomposed into pyrogallic ($C_6H_6O_3$) and metagallic ($C_6H_4O_2$) acids, water and carbonic acid being evolved. Tannic acid leaves no residue when burned with free access of air.

Acidum Tartaricum.

In colourless crystals, the primary form of which is the oblique rhombic prism; these are pyro-electric, and become luminous in the dark by friction. Tartaric acid has a strongly acid taste, and is readily soluble in water and in rectified spirit. The aqueous solution becomes mouldy on keeping, acetic acid being formed; the addition of a little rectified spirit acts as a preservative. When to a solution of it, not too much diluted, a little acetate of potassium is added, a white crystalline precipitate of acid tartrate of potassium is formed.

Tartaric acid, neutralised by an alkali, gives a white precipitate of tartrate of lime with solution of chloride of calcium, which is soluble in cold solution of potash, and is reprecipitated on boiling. With nitrate of silver the acid gives a white precipitate of tartrate of silver, which blackens on boiling, owing to the separation of metallic silver. These three tests serve to distinguish tartaric from citric acid. Twenty-five grains of the crystallised tartaric acid dissolved in water require for neutralisation 330 grain-measures of the volumetric solution of soda. An aqueous solution of tartaric acid should not be affected by sulphuretted hydrogen (absence of metallic impurities), and should not give a precipitate with a solution of sulphate of lime (absence of oxalic acid), or with oxalate of ammonium (absence of lime). It leaves little or no residue when burned with free access of air. When heated with caustic alkalies, an oxalate and an acetate of the base are formed :—

$$H_2C_4H_4O_6 + 3KHO = K_2C_2O_4 + KC_2H_3O_2 + 3H_2O.$$

Boiled with nitric acid it is converted into oxalic acid.

COMPOUNDS OF ALUMINIUM. [Al.=27·4]

Compound.	B. P. Preps.	Strength.	Dose.	Action and Use.
ALUMEN Alum $NH_4Al(SO_4)_2,12H_2O$	—	—	10 to 20 grs.	Astringent, and in large doses emetic and purgative. Used locally as an astringent gargle, lotion, or injection.
	Alumen Exsiccatum	—	—	Dried alum is a slight escharotic, and is only used externally.

Alumen.

Usually made by exposing alum schist to the air; the silicate of aluminium and bisulphide of iron (iron pyrites) originally present becoming, under the influence of oxidation and chemical change, sulphate of aluminium, sulpate of iron, etc. The sulphates are then dissolved out with water, sulphate of ammonium is added, and the ammonia alum thus formed finally crystallised out.

Dried alum is prepared by heating the ordinary alum in a suitable vessel till it fuses, and then raising the heat to not above 400°, so as to drive off the water of crystallisation which forms 47 per cent. of its weight. Above 400° alum is decomposed, and ammonia and sulphuric acid are given off.

Alum occurs in colourless transparent crystalline masses, exhibiting the faces of the regular octahedron, and having an acid sweetish astringent taste. It is slightly efflorescent in dry air, from loss of some of its water of crystallisation. Alum is soluble in about 18 parts of cold water, and in three-fourths of its weight of boiling water. Its aqueous solution gives with caustic potash or soda a white precipitate of hydrate of alumina which is soluble in excess of the reagent (showing absence of lime), and the mixture evolves ammonia, especially when heated. The aqueous solution gives an immediate precipitate with chloride of barium (characteristic of all soluble sulphates). It does not acquire a blue colour on the addition of yellow or red prussiate of potash (absence of per- or proto-salts of iron). When calcined, pure oxide of aluminium (Al_2O_3) is left behind. The potash alum of commerce is termed "rock alum."

COMPOUNDS OF AMMONIUM. [NH_4=18.]

Name.	B. P. Preps.	Strength.	Dose.	Action and Use.
AMMONII ACETAS Acetate of Ammonium	Liquor fortior	—	25 to 75 mins.	Diaphoretic, diuretic, and refrigerant.
$NH_4C_2H_3O_2$	Liquor	1 in 6	2 to 6 drms.	
AMMONII BENZOAS Benzoate of Ammonium $NH_4C_7H_5O_2$	—	—	10 to 20 grs.	Diuretic and slight stimulant. Used in chronic inflammation of bladder with alkaline urine and a tendency to phosphatic deposits.

COMPOUNDS OF AMMONIUM. [$NH_4=18$] (*continued*).

Name.	B. P. Preps.	Strength.	Dose.	Action and Use.
Ammonii Carbonas Carbonate of Ammonium $H_3H_{11}C_2O_5$	—	—	3 to 10 grs.	Stimulant in low states of the system; antacid in dyspepsia with increased secretion of acid, and stimulating expectorant in bronchitis. Seldom used as an emetic.
	Spiritus Ammoniæ Aromaticus	—	½ to 1 drm.	Same as carbonate.
	Solution of (App. II.)	1 in 20	—	Test for purity of bismuth and of zinci carb. and oxid.
Ammonii Citras Citrate of Ammonium $(NH_4)_3C_6H_5O_7$	Liquor fortior	—	30 to 90 mins.	Febrifuge, refrigerant, and slightly diuretic.
	Liquor	1 in 5	2 to 6 drms.	
Ammonii Nitras Nitrate of Ammonium NH_4NO_3	—	—	—	Used in making nitrous oxide. Not given in medicine.
Ammonii Oxalas Oxalate of Ammonium $(NH_4)_2C_2O_4$	Solution of (App. II.)	1 in 40	—	Test for lime.
Ammonii Phosphas Phosphate of Ammonium $(NH_4)_2HPO_4$	—	—	5 to 20 grs.	Used in urinary diseases with a tendency to uric acid calculi, and in gout.
Ammonii Bromidum Bromide of Ammonium NH_4Br.	—	—	2 to 20 grs.	Nerve sedative; used in epilepsy and pertussis; similar to the corresponding potassium salt.
Ammonii Chloridum Chloride of Ammonium or Sal Ammoniac NH_4Cl.	—	—	5 to 20 grs.	Alterative, cholagogue (?) emmenagogue (?). Relieves certain neuralgias. Used as a substitute for mercury in chronic inflammation. Useful in chronic bronchitis with profuse expectoration.
	Solution of (App. II.)	1 in 10	—	Applied externally as a discutient and as a refrigerant lotion.
Ammonii Sulphidum Sulphide of Ammonium NH_4HS	Solution of (App. II.)	—	—	Test for copper, lead, cadmium, zinc, etc.

PREPARATION.

Chloride of Ammonium.

Neutralise the ammoniacal liquor of gas-works by hydrochloric acid, and purify the crystals by sublimation:

$$NH_3 + HCl = NH_4Cl;$$

or neutralise the ammoniacal liquor by sulphuric acid; mix the resulting sulphate of ammonium with chloride of sodium and sublime; sulphate of sodium remains, while chloride of ammonium volatilises:—

$$2NaCl + (NH_4)_2SO_4 = 2NH_4Cl + Na_2SO_4.$$

From the **Chloride** are prepared:—

1. **Strong Solution of Ammonia.**

Vide "The Pharmacopœial Preparations" (Part II.).

2. **Carbonate of Ammonium.**

Heat it with chalk; chloride of calcium and carbonate of ammonium are thus formed; the latter volatilises and is condensed:—

$$4NH_4Cl + 2CaCO_3 = N_3H_{11}C_2O_5 + 2CaCl_2 + NH_3 + H_2O.$$

From the **Strong Solution of Ammonia** are prepared:—

1. **Citrate of Ammonium (Solution of).**

Add to a solution of citric acid in distilled water until the liquid is neutral.

2. **Phosphate of Ammonium.**

Add diluted phosphoric acid to it until the solution is slightly alkaline; then evaporate, adding ammonia from time to time so as to keep it in slight excess, in order to prevent the formation of acid phosphate. When crystals are formed, on the cooling of the solution, dry them quickly on filtering-paper placed on a porous tile:—

$$H_3PO_4 + 2NH_4HO = (NH_4)_2HPO_4 + 2H_2O.$$

From the **Solution of Ammonia** (1 pt. Liq. Am. Fort. to 2 pts. distilled water) are prepared :—

1. **Benzoate of Ammonium.**

Dissolve benzoic acid in slight excess of it, and slowly evaporate :—

$$NH_4HO + HC_7H_5O_2 = NH_4C_7H_5O_2 + H_2O.$$

2. **Bromide of Ammonium.**

Saturate hydrobromic acid with ammonia :—

$$HBr + NH_4HO = NH_4Br + H_2O.$$

3. **Sulphide of Ammonium.**

Pass sulphuretted hydrogen into solution of ammonia as long as the gas continues to be absorbed, then add more ammonia, and transfer the solution to a well-stoppered green glass bottle :—

$$NH_3 + H_2S = NH_4HS. \quad NH_4HS + NH_3 = (NH_4)_2S.$$

From the **Carbonate** is prepared :—

1. **Acetate of Ammonium (Solution of).**

Add acetic acid to it gradually until a neutral solution is formed; then add water.

2. **Oxalate of Ammonium.**

Neutralise it with solution of oxalic acid.

3. **Nitrate of Ammonium.**

Saturate dilute nitric acid with it, and evaporate to crystallisation :—

$$N_3H_{11}C_2O_5 + 3HNO_3 = 3NH_4NO_3 + 2CO_2 + H_2O.^*$$

CHARACTERS AND TESTS.

Ammonii Benzoas.

In colourless laminar crystals. Soluble in water, thus differing from benzoic acid; soluble also in alcohol. It gives a bulky reddish precipitate with persalts of iron (ferric benzoate). Its aqueous solution, when heated with caustic potash, evolves ammonia (characteristic of ammonia salts), and, if it be not too dilute, when acidulated with hydrochloric acid gives a deposit of benzoic acid (*vide* p. 16). When heated it sublimes without any residue.

---

* May be also obtained by neutralising the diluted acid with solution of ammonia.

Ammonii Carbonas.

The formula of carbonate of ammonium is probably constituted of one molecule of acid carbonate (NH_4HCO_3), and one molecule of carbamate of ammonium ($NH_4NH_2CO_2$). It occurs in translucent crystalline masses, with a strong ammoniacal odour, an acrid taste, and alkaline reaction. On exposure to air, its odour is dissipated, from the continued volatilisation of the neutral carbonate, a white, opaque powder of acid carbonate being left. The commercial salt is soluble in cold water, but is decomposed by boiling water and alcohol.

In water the carbamate changes into the neutral carbonate :—

$$NH_4NH_2CO_2 + H_2O = (NH_4)_2CO_3\ ;$$

hence the aqueous solution will contain both neutral and acid carbonate of ammonium. The neutral carbonate has not yet been isolated in the solid state. Carbonate of ammonium is readily dissolved by acids, with effervescence. If dilute nitric acid be added to it in slight excess, and the solution be boiled, it will give no precipitate with chloride of barium (absence of sulphates), or with nitrate of silver (absence of chlorides). Fifty-nine grains of it dissolved in an ounce of distilled water will be neutralised by 1,000 grain-measures of the volumetric solution of oxalic acid. As the carbonate of ammonium may be said to contain four molecules, it follows that 59 grains (*i.e.*, one-fourth of its molecular weight, 236) should neutralise 1,000 grain-measures of the oxalic acid solution (*i.e.*, half a molecule, oxalic acid being a dibasic acid).

Twenty grains of carbonate of ammonium neutralise $26\frac{3}{4}$ grains of citric acid, $28\frac{3}{4}$ grains of tartaric acid, and 6 drachms of lemon-juice.

Ammonii Nitras.

A white, deliquescent salt, in confused crystalline masses, having a bitter, acrid taste. Soluble in less than its own weight of water, and sparingly soluble in rectified spirit. A solution of one part in eight of distilled water gives no precipitate with solution of nitrate of silver (absence of chlorides), or with solution of chloride of barium (absence of sulphates). Heated with caustic potash, it evolves ammonia; with sulphuric acid, it emits nitric acid vapour (characteristic of a nitrate). It fuses at a temperature of 320°, and at 350° to 450° it is entirely resolved into nitrous oxide (laughing gas) and aqueous vapour :—

$$NH_4NO_3 = N_2O + 2H_2O.$$

Ammonii Oxalas.

Colourless prisms, resembling Epsom salts; heated with caustic potash, it evolves ammonia. The aqueous solution gives a copious white precipitate with neutral or alkaline solutions of lime. Completely dissipated by heat.

Ammonii Phosphas.

In colourless prisms, which are transparent when recent, but which effloresce and become opaque on exposure, losing both ammonia and water. It is soluble in water, but, unlike the benzoate, insoluble in rectified spirit. Heated with caustic potash, it evolves ammonia. Its aqueous solution gives a yellow precipitate with nitrate of silver, being a salt of tribasic phosphoric acid. If 20 grains of the salt be dissolved in water, and solution of ammonio-sulphate of magnesium added, a crystalline precipitate of ammonio-magnesian phosphate falls, which, when well washed upon a filter with solution of ammonia, diluted with an equal volume of water, dried, and heated to redness, forms pyro-phosphate of magnesium ($Mg_2P_2O_7$), leaving 16·8 grains, a little more than four-fifths of the original quantity of the salt operated upon.

Ammonii Bromidum.

In colourless crystals, which become slightly yellow on exposure, from decomposition and liberation of bromine; has a pungent, saline taste; may be sublimed unchanged by heat. Readily soluble in water; less soluble in spirit. A solution of it in water, mixed with mucilage of starch and a drop of an aqueous solution of chlorine or bromine added, does not develop a blue colour (absence of iodide).

Ammonii Chloridum.

In colourless, inodorous, translucent, tough, fibrous masses, difficult to pulverise; has a pungent, saline taste, which is best disguised by liquorice; sp. gr. 1·45. Is soluble in water, less so in spirit, and sparingly soluble in absolute alcohol. It crystallises from its aqueous solution in octahedra. Heated with caustic potash, it evolves ammonia, and when treated with nitrate of silver, forms a copious curdy precipitate. When heated it volatilises without decomposition, and leaves no residue.

Ammonii Sulphidum.

The solution of sulphide of ammonium is colourless, becoming greenish-yellow on exposure to air and light, from formation of disulphide and hyposulphite of ammonium due to the absorption of oxygen. It should be kept in green glass bottles, as it attacks the lead of white glass. It has an intensely disagreeable, pungent odour. Sp. gr. 0·999. Chiefly used as a test for certain metals.

COMPOUNDS OF ANTIMONY. [Sb=122.]

Name.	B. P. Preps.	Strength.	Dose.	Action and Use.
Antimonii Chloridum Chloride of Antimony $SbCl_3$	Liquor Antim. Chloridi	—	—	Locally a powerful caustic Used in the preparation of Antim. Oxidum.
Antimonii Oxidum Oxide of Antimony Sb_2O_3	—	—	1 to 4 grs.	Diaphoretic. In large doses emetic.
	Pulvis Antimonialis	1 pt. in 3	3 to 10 grs.	*Ibid.*
Antimonium Nigrum Black Antimony Sb_2S_3	—	—	—	Used to prepare Antimonium Sulphuratum and Liquor Antimonii Chloridum.
Antimonium Sulphuratum Sulphurated or Golden Sulphide of Antimony Sb_2S_5,Sb_2O_3	—	—	1 to 5 grs.	Alterative and diaphoretic. In large doses emetic.
	Pil. Hydrargyri Subchlor. Co.	1 pt. in 5	5 to 10 grs.	Alterative. Used in syphilis, cutaneous affections, and in chronic rheumatism.
Antimonium Tartaratum Tartarated Antimony, or Potassio-tartrate of Antimony, or Tartar Emetic $(KSbC_4H_4O_6).2H_2O$	—	—	$\frac{1}{16}$ to 1 gr., diaphoretic; 1 to 2 grs., emetic.	In small doses diaphoretic, expectorant, probably cholagogue. In large doses a depressing emetic, sometimes purgative. When tolerance is established, a vascular sedative. Used in acute inflammations, and to relax muscular spasm.
	Unguentum Antim. Tart.	1 pt. in 5	—	Used as a counter-irritant. Produces a papulo-pustular eruption.
	Vinum Antimoniale	2 grs. in 1 oz.	5 min. to 1 drm.	Similar to Ant. Tart.

PREPARATION.

Sulphide of Antimony.

Occurs native; it is purified from silicious matter by fusion, and from arsenic by washing with a solution of ammonia, and is afterwards reduced to fine powder.

From the **Sulphide** are prepared :—

1. **Antimonii Chloridi Liquor.**
Vide "Pharmacopœial Preparations."

2. **Sulphurated Antimony.**

Mix black antimony (10 oz.) with solution of soda (4½ pints), and boil for two hours with frequent stirring, adding distilled water occasionally to maintain the same volume. A double salt, a sulphide of sodium and antimony, and a double oxide of sodium and antimony, both soluble in the hot alkaline solution, are formed :—

$$2Sb_2S_3 + 6NaHO = 2Na_3SbS_3 + Sb_2O_3 + 3H_2O\,;$$
$$\text{and } Sb_2O_3 + 6NaHO = 2Na_3SbO_3 + 3H_2O.$$

The sulphide of sodium combines with and dissolves some of the undecomposed sulphide of antimony, while the oxide of antimony does the same with the undecomposed soda. Strain now through calico, and *before it cools* (as in the hot alkaline solution no precipitate occurs) add to it by degrees diluted sulphuric acid till the latter is slightly in excess. The sulphate of sodium is formed in solution, and the sulphide and oxide of antimony are all precipitated as sulphurated antimony :—

$$2Na_3SbS_3 + 3H_2SO_4 = 3Na_2SO_4 + Sb_2S_3 + 3H_2S\,;$$
$$2Na_3SbO_3 + 3H_2SO_4 = 3Na_2SO_4 + Sb_2O_3 + 3H_2O.$$

Collect the precipitate on a calico filter, wash away the sulphate of sodium with distilled water until the washings no longer give a precipitate with chloride of barium, and finally dry at a temperature not exceeding 212°.

From the **Chloride** is prepared :—

Oxide of Antimony.

Pour solution of chloride of antimony 16 oz.) into water (2 gallons); mix thoroughly; let the precipitate settle; remove the supernatant liquid by a syphon; add distilled water (1 gallon); agitate well; let the precipitate subside; again withdraw the fluid, and repeat the processes of affusion of distilled water, agitation, and subsidence. The precipitate formed in the foregoing process consists of oxychloride of antimony :—

$$12SbCl_3 + 15H_2O = \underbrace{2SbCl_3,5Sb_2O_3}_{\text{Oxychloride of antimony.}} + 30HCl.$$

Add now carbonate of soda (6 oz.) previously dissolved in distilled water (2 pints), to form oxide of antimony and chloride of sodium :—

$$2SbCl_3 5Sb_2O_3 + 3Na_2CO_3 = 6Sb_2O_3 + 6NaCl + 3CO_2.$$

Leave them in contact for half an hour, stirring frequently; collect the deposit (oxide of antimony) on a calico filter, wash away the chloride of sodium with boiling distilled water until the washings cease to give a precipitate with solution of nitrate of silver acidulated with nitric acid. Lastly, dry the product at a heat not exceeding 212°, to avoid absorption of oxygen and formation of higher oxides of antimony (Sb_2O_4, and Sb_2O_5).

From the **Oxide** is prepared :—

Tartarated Antimony.

Mix oxide of antimony (5 oz.) and finely powdered acid tartrate of potash (6 oz.) with sufficient water to form a paste, and set aside for twenty-four hours. Then add distilled water (nearly 2 pints), and boil for a quarter of an hour, stirring frequently. Filter, and set aside to crystallise. Pour off the mother-liquor, evaporate to one-third, and set aside that more crystals may form. Dry the crystals on filtering-paper at the temperature of the air. In this process the oxide of antimony (Sb_2O_3) merely displaces the acidulous radical H in the acid tartrate of potash :—

$$Sb_2O_3 + 2KHC_4H_4O_6 = 2KSbC_4H_4O_7 + H_2O.$$

CHARACTERS AND TESTS.

Antimonii Oxidum.

A greyish-white powder, fusible at a low red heat, insoluble in water, but readily dissolved by hydrochloric acid :—

$$Sb_2O_3 + 6HCl = 2SbCl_3 + 3H_2O.$$

This solution dropped into distilled water gives a white deposit (the oxychloride, or Algarothi's powder), which is at once changed to orange (the golden sulphide, or antimonium sulphuratum) by sulphuretted hydrogen. It is entirely soluble also in acetic and tartaric acids, if the higher oxides of antimony be not present. It is dissolved by solutions of caustic potash and soda. It dissolves entirely when boiled with an excess of acid tartrate of potassium, forming tartarated antimony. It should not yield any sublimate when fused in a test-tube (absence of arsenious acid).

Antimonium Nigrum.

A greyish-black crystalline powder; sp. gr. 4·6; is insoluble in water, but dissolves almost entirely in boiling hydrochloric acid, evolving sulphuretted hydrogen :—

$$Sb_2S_3 + 6HCl = 2SbCl_3 + 3H_2S.$$

It fuses below a red heat. It is apt to contain iron, arsenic, lead, or copper.

Antimonium Sulphuratum.

An orange-red powder, odourless, with a slight taste; when heated, it takes fire, and burns with a greenish-blue flame, giving off SO_2. Exposure to light and air causes partial decomposition, with separation of sulphur. It is insoluble in water; is readily dissolved by caustic soda, also by hydrochloric acid, with evolution of sulphuretted hydrogen and the separation of a little sulphur. Boiled in water with acid tartrate of potassium, the resulting solution is precipitated orange-red with sulphuretted hydrogen, proving the presence of oxide of antimony, which is dissolved by excess of the cream of tartar. Sixty grains of this preparation, dissolved in hydrochloric acid and dropped into water, give a white precipitate (the oxychloride), which, when washed and dried, weighs about 53 grains.

Antimonium Tartaratum.

In colourless transparent crystals exhibiting triangular facets; these become efflorescent and opaque on exposure to air. They have a slight metallic taste; are soluble in about 15 parts of cold water, in 2 parts of boiling water; partially soluble in proof-spirit, and insoluble in absolute alcohol. The aqueous solution reddens litmus; it decomposes readily with the formation of algæ (*Sirocrosis tartarica*). Tartar emetic decrepitates and blackens on the application of heat. Its solution in water gives with hydrochloric acid a white precipitate, soluble in excess, and which is not formed if tartaric acid be previously added. Antimonial salts are thus distinguished from salts of bismuth, which also give precipitates with water, but are not dissolved by tartaric acid. Twenty grains dissolve without residue in a fluid ounce of distilled water at 60°, and the solution gives with sulphuretted hydrogen an orange precipitate, which, when washed and dried at 212°, weighs 9·91 grains. Solution of tartar emetic is not precipitated by ferrocyanide of potassium, chloride of barium, or nitrate of silver, unless it be concentrated.

COMPOUNDS OF ARSENIC. [As=75.]

Name.	B. P. Preps.	Strength.	Dose.	Action and Use.
ARSENII IODIDUM Iodide of Arsenic AsI_3	Liq. Arsenii et Hydrargyri Iodidi	1 gr. in 110 mins.	10 to 30 mins.	Is a nerve tonic; given for psoriasis, chorea, etc. Also as an antiperiodic in agues and neuralgic affections.
ACIDUM ARSENIOSUM Arsenious Acid As_2O_3	—	—	$\frac{1}{60}$ to $\frac{1}{12}$ gr.	
	Liq. Arsenicalis	1 gr. in 110 mins.	2 to 8 mins.	
	Liq. Arsenici Hydrochloricus	1 gr. in 110 mins.	2 to 8 mins.	
	Ferri Arsenias	—	$\frac{1}{16}$ gr.	
	Sodii Arsenias		$\frac{1}{16}$ to $\frac{1}{8}$ gr.	

PREPARATION.

Iodide of Arsenic.

Is obtained by direct combination of iodine and metallic arsenic or by evaporating to dryness an aqueous mixture of arsenious and hydriodic acids.

$$As_2 + 3I_2 = 2AsI_3.$$

From the **Iodide** is prepared :

Liquor Arsenii et Hydrargyri Iodidi.

Vide "Pharmacopœial Preparations."

Acidum Arseniosum.

Vide "Acids."

Liquor Arsenicalis.

Liquor Arsenici Hydrochloricus.

Vide "Pharmacopœial Preparations."

Ferri Arsenias.

Vide "Compounds of Iron."

Sodii Arsenias.

Vide "Compounds of Sodium."

COMPOUNDS OF SILVER. [Ag=108.]

Name.	B. P. Preps.	Strength.	Dose.	Action and Use.
Argenti Nitras	—	—	⅓ to ⅙ gr.	Externally astringent, irritant, vesicant, and escharotic. Internally astringent, and alterative to alimentary mucous membrane. Used in chronic gastric affections, diarrhœa, etc. Nervine tonic. Given in epilepsy and chorea.
Nitrate of Silver $AgNO_3$	Argenti et Potassii Nitras	1 in 3	—	
	Volumetric Solution of (App. III.)	17 grs. in 1,000	—	Used in testing Acid. Hydrocyanic. Dil., Potass. Bromid., and Sodii Arsenias.
Argenti Oxidum Oxide of Silver Ag_2O	—	—	½ gr. to 2 grs.	Similar action to the nitrate, but is less energetic topically.

PREPARATION.

Nitrate of Silver.

Add nitric acid (2½ ozs.) and water (5 ozs.) to refined silver (3 ozs.) in a flask, and apply a gentle heat till the metal is dissolved :—

$$3Ag+4HNO_3=3AgNO_3+NO+2H_2O.$$

Decant the clear liquor from any black powder (trace of gold or of sulphide of silver) which may be present, into a porcelain dish; evaporate, and set aside to crystallise. Let the crystals drain in a glass funnel, and dry them by exposure to the air, carefully avoiding the contact of all organic substances. To obtain the nitrate of silver in rods, fuse the crystals in a capsule of platinum or thin porcelain, and pour the melted salt into proper moulds.

From the **Nitrate** is prepared :—

Argenti et Potassii Nitras.

Is made by fusing nitrate of silver in a platinum capsule with twice its weight of nitrate of potassium, the mixture being poured into moulds.

Toughened Nitrate of Silver, or "**Toughened Caustic**" is incidentally directed to be made by adding 5 per cent. of nitrate of potassium before fusing.

Oxide of Silver.

Dissolve nitrate of silver ($\frac{1}{2}$ oz.) in distilled water (4 ozs.), and, having poured the solution into a bottle containing solution of lime ($3\frac{1}{2}$ pints), shake the mixture well, and set aside to allow the deposit to settle :—

$$2AgNO_3 + Ca2HO = Ca2NO_3 + Ag_2O + H_2O.$$

Draw off the supernatant liquid, collect the deposit on a filter, wash it with distilled water, and dry it at a heat not exceeding 212°.

CHARACTERS AND TESTS.

Argenti Nitras.

In colourless tabular crystals, the primary form of which is the right rhombic prism; or in white cylindrical rods, "lunar caustic." Soluble in its own weight of distilled water at 60°; soluble also in rectified spirit. The solution gives with hydrochloric acid a curdy white precipitate ($AgCl$), which darkens on exposure to light, chlorine being set free, and a subchloride of silver being formed. This precipitate is soluble in ammonia, but not in nitric acid. A small fragment of nitrate of silver, heated on charcoal with the blow-pipe, first melts, and then, like all other nitrates, deflagrates, leaving behind a dull white metallic coating (metallic silver). Crystals of nitrate of silver are apt to contain copper and lead; in the fused form nitre may be present, being occasionally added to render the sticks less brittle, and to moderate the caustic action. Ten grains of the salt dissolved in 2 fluid drachms of distilled water give, with hydrochloric acid, a precipitate, which, when washed and thoroughly dried, weighs 8·44 grains. The filtrate, when evaporated by a water bath, should leave no residue (absence of copper, lead, and nitrates of sodium or potassium).

Stains of nitrate of silver may be removed by solution of cyanide of potassium; or by moistening them with solution of iodide of potassium, and subsequently washing with hyposulphite of sodium.

Toughened nitrate of silver, or "toughened caustic," is made in sticks. Ten grains of this preparation will yield with hydrochloric acid 8 grains of precipitate, and the filtrate, when evaporated, will yield a white residue.

Argenti et Potassii Nitras.

White or greyish-white cylindrical rods, freely soluble in distilled water, but only sparingly in rectified spirit. The aqueous solution gives with hydrochloric acid a curdy white precipitate, which darkens by exposure to light; the filtrate from this mixture giving a yellow precipitate with perchloride of platinum, and evolving ruddy fumes when warmed with sulphuric acid and copper. Thirty grains dissolved in ½ oz. of distilled water give with hydrochloric acid a precipitate, which, when washed with hot distilled water and dried, weighs 8·44 grains.

Argenti Oxidum.

An olive-brown powder, becoming black by age, and undergoing partial reduction. At a low red heat it gives off oxygen, and is reduced to the metallic state. It is insoluble in water, feebly soluble in ammonia, and the solution on exposure deposits an explosive black powder known as fulminating silver. It dissolves completely in nitric acid, without evolution of any gas (absence of carbonate of silver, which is sometimes present from the precipitant used in its preparation containing some carbonic acid). The solution in nitric acid presents the characters of nitrate of silver. Twenty-nine grains of the oxide of silver heated to redness leave 27 grains of metallic silver. The molecular equivalent of the oxide is 232, and that of silver is 216; and 232 is to 216 as 29 is to 27.

Salts of silver, especially the oxide, decompose in contact with organic matter, especially with creasote, carbolic acid, or any of the essential oils. Hence, in their preparation their solutions are decanted, not filtered. Combustion or explosion may result from this decomposition, and care must consequently be taken in compounding them.

COMPOUNDS OF BISMUTH. [Bi = 210.]

Name.	B. P. Preps.	Strength.	Dose.	Action and Use.
Bismuthi Carbonas Carbonate of Bismuth $2(Bi_2CO_5),H_2O$	—	—	5 to 20 grs.	Astringent, and sedative to alimentary mucous membrane. Used in irritative dyspepsia, gastralgia, chronic vomiting, and diarrhœa of phthisis. Applied locally as a sedative and absorbent in skin affections, leucorrhœa, and gleet.
Bismuthi Citras Citrate of Bismuth $BiC_6H_5O_7$	Liquor Bismuth et Ammon. Cit.	3 grs. of oxide to 1 drm.	30 to 60 mins.	Same as the carbonate.
	Bismuthi et Ammon. Cit.	—	2 to 5 grs.	Same as the carbonate.
Bismuthi Oxidum Oxide of Bismuth Bi_2O_3	—	—	5 to 15 grs.	Same as the carbonate.
Bismuthi Subnitras	—	—	5 to 20 grs.	Same as the carbonate.
Subnitrate of Bismuth or White Bismuth $BiNO_4,H_2O$	Trochisci Bismuthi	2 grs in each	1 to 6	

PREPARATION.

Carbonate of Bismuth.

Mix nitric acid (4 ozs.) with distilled water (3 ozs.), and add purified bismuth (2 ozs.) by degrees to form the normal nitrate ($Bi + 4HNO_3 = BI3NO_3 + NO + 2H_2O$). When effervesence, due to escape of nitric oxide gas, has ceased, apply for ten minutes a heat approaching that of ebullition, and afterwards decant the solution from any insoluble matter that may be present. Evaporate the solution so as to remove excess of acid and concentrate it until it is reduced to two fluid ounces, and add this in small quantities at a time to a cold filtered solution of carbonate of ammonium (6 ozs.) in distilled water (2 pints) constantly stirring the mixture :—

$$2(Bi3NO_3) + 2N_3H_{11}C_2O_5 + H_2O = 6NH_4NO_3$$
$$+ Bi_2O_2CO_3 + 3CO_2$$

Collect the precipitate of hydrated oxycarbonate on a calico filter; wash it with distilled water until the washings pass tasteless. Remove now as much of the adhering water as can be separated from the precipitate by slight pressure, and finally dry the product at a temperature not exceeding 150°, to avoid decomposition.

Subnitrate of Bismuth.

Mix nitric acid (4 ozs.) with distilled water (3 ozs.), and add purified bismuth (2 ozs.) by degrees to form the normal nitrate ($Bi + 4HNO_3 = Bi3NO_3 + NO + 2H_2O$). When effervescence has ceased, apply for ten minutes a heat approaching that of ebullition, and decant the solution from any insoluble matter that may be present. Evaporate the solution until it is reduced to two fluid ounces, and pour it into half a gallon of distilled water; the subnitrate is thus precipitated, while supernitrate of bismuth remains in solution :—

$$5Bi3NO_3 + 8H_2O = 4BiNO_4,\ H_2O + Bi3NO_3,\ 8HNO_3.$$

When the precipitate has subsided, decant the supernatant liquid, containing the supernitrate of bismuth, add half a gallon of distilled water to the precipitate, stir well, and after two hours decant off the liquid, collect and drain the precipitate in a calico filter, press it and dry it at a temperature not excceding 150°, to avoid decomposition.

From the **Subnitrate** is prepared :—

Citrate of Bismuth.

Heat subnitrate of Bismuth ($5\frac{1}{2}$ ozs.) with nitric and (11 ozs. or a sufficiency) until the salt is dissolved ; add distilled water with constant stirring until the cloudiness produced by the water no longer rapidly disappears ; to the clear or only faintly opalescent solution add a solution of citrate of sodium (prepared by dissolving 8 ozs. of bicarbonate of sodium in water, to which is added 4 ozs. of citric acid, the whole being boiled until all the carbonic acid gas is expelled). Heat to boiling point, occasionally stirring and then set aside to cool. When cold, filter and wash the precipitate of citrate of Bismuth until no free nitric acid remains. Dry the product over a water bath.

Liquor Bismuthi et Ammonii Citratis.

(Vide "Pharmacopœial preparations").

Citrate of Bismuth et Ammonium.

Evaporate the solution of citrate of Bismuth and Ammonium over a water bath to the consistence of a syrup, spread the resulting fluid in a thin layer on glass or porcelain plates and dry at a temperature not exceeding 100° F.

Oxide of Bismuth.

Mix subnitrate of bismuth (1 pound) with solution of soda (4 pints), and boil for five minutes—

$$2BiNO_4 + 2NaHO = Bi_2O_3 + H_2O + 2NaNO_3 ;$$

then having allowed the mixture to cool, and the precipitated oxide to subside, decant the supernatant liquid, and wash the precipitate thoroughly with distilled water, to remove the nitrate of sodium, and finally dry the oxide by the heat of a water bath.

In this process excess of soda is necessary for the complete removal of the nitric acid.

[The *Liquor Bismuthi et Ammonii Citratis* is prepared by adding to a concentrated solution of nitrate of bismuth a solution of citric acid, and subsequently solution of ammonia, until the precipitate formed is re-dissolved and the solution becomes neutral. Each drachm of the diluted solution contains three grains of Bi_2O_3.]

CHARACTERS AND TESTS.

Bismuthi Carbonas.

A white powder blackened by sulphuretted hydrogen (black sulphide, Bi_2S_3). Like all neutral and basic carbonates, except those of ammonium, potassium, and sodium, it is insoluble in water, but soluble with effervescence (CO_2) in nitric acid. When added to sulphuric acid coloured with sulphate of indigo, the colour of the latter is not discharged (absence of any nitrate). If to nitric acid mixed with half its volume of distilled water as much carbonate of bismuth be added as the acid will dissolve, one volume of the solution poured into twenty volumes of water will yield a white precipitate (test for presence of a bismuth salt). The nitric acid solution gives no precipitate with dilute sulphuric acid (absence of lead), or with solution of nitrate of silver (absence of chlorides).

Bismuthi Oxidum.

A dull lemon-yellow powder. Heated to incipient redness it is not diminished in weight, being anhydrous. (The hydrate $Bi3HO$ is formed if ammonia be used instead of soda in precipitating the oxide from the nitrate.) It is insoluble in water, but soluble in nitric acid mixed with half its volume of water, forming a neutral nitrate; if it be thus dissolved to saturation, the solution poured into twenty times its volume of water yields a precipitate of subnitrate of bismuth. The nitric acid solution gives no precipitate with diluted sulphuric acid (absence of lead), nor with solution of nitrate of silver dropped into it (absence of chlorides). Solution of chloride of ammonium added to the nitric acid solution gives a white precipitate of oxychloride of bismuth, $2(BiCl_3, Bi_2O_3), H_2O$; if this be treated with excess of solution of ammonia, then filtered, and the clear filtrate neutralised with hydrochloric acid, it should not become turbid (absence of silver).

Bismuthi Subnitras.

A tasteless heavy white powder in minute crystalline scales. Blackened by sulphuretted hydrogen. Insoluble in water, but soluble in nitric acid mixed with half its volume of distilled water, forming a solution which, poured into water, gives a white precipitate of the subnitrate. It forms with sulphuric acid, diluted with an equal bulk of water, a solution which is blackened with sulphate of iron (characteristic of the presence of a nitrate). The nitric acid solution gives no precipitate with dilute sulphuric acid (absence of lead), or with solution of nitrate of silver (absence of chlorides).

Bismuthi Citras.

A white powder soluble in solution of ammonia. The solution yields a black precipitate with sulphuretted hydrogen (bismuth sulphide), and the filtrate from this precipitate after it has been boiled until free from ammonia and filtered, gives a white precipitate when warmed with lime water (citrate of calcium). This filtrate should not give a dark colour round a crystal of sulphate of iron in an equal bulk of sulphuric acid (absence of nitric acid). Ten grains dissolved in solution of ammonia and treated with sulphuretted hydrogen in excess yields a precipitate which, when washed and dried, weighs about seven grains.

Bismuthi et Ammonii Citras.

Small, shining, translucent scales, having a slightly metallic taste, very soluble in water, yielding ammonia when warmed with a solution of caustic potash. On ignition the salt chars and yields a residue for the most part black but with a yellow surface, soluble in a little nitric acid. The latter solution should stand the tests for impurities described in connection with "purified bismuth." Ten grains dissolved in water and treated with sulphuretted hydrogen in excess yields a precipitate which when washed and dried weighs about six and a half grains.

COMPOUNDS OF CALCIUM. [Ca=40.]

Name.	B. P. Preps.	Strength.	Dose.	Action and Use.
Calcii Chloridum Chloride of Calcium $CaCl_2$	—	—	10 to 20 grs.	Acts on glandular system; formerly used in scrofula. Allays certain forms of vomiting.
	Solution of (App. II.)	1 in 10	—	Test for Potassii Citras.
	Saturated solution of (App. II.)	4 in 5	—	Used in estimating strength of Sp. Æther. Nitrosi.
Calcii Carbonas Precipitata Precipitated Carbonate of Lime $CaCO_3$	—	—	10 to 60 grs.	Antacid and astringent; given in acidity with diarrhœa. Contained in Troch. Bismuthi; 4 grains in each lozenge.
Calcii Hydras Slaked Lime CaH_2O_2	Liq. Calcis	11½ grs. to 1 pt.	1 to 4 ozs.	Antacid and slightly astringent; given in acidity with diarrhœa.
	Liq. Calcis Saccharatus	8 grs. to 1 oz.	15 to 60 mins.	Ditto.

COMPOUNDS OF CALCIUM. [Ca=40] (*continued*).

Name.	B. P. Preps.	Strength.	Dose.	Action and Use.
CALCII HYPOPHOSPHIS Hypophosphite of Lime $Ca2PH_2O_2$	—	—	5 to 10 grs.	Stimulant, alterative, and tonic, like Phosphorus, but less objectionable. Used in pulmonary phthisis, nervous depression, etc.
CALCII PHOSPHAS Phosphate of Lime $Ca_3P_2O_8$	—	—	10 to 20 grs.	Used in scrofula, rickets, and osteomalacia; hectic and other wasting diseases. Contained in Pulvis Antimonialis.
CALCII SULPHAS Sulphate of Lime	—	—	—	Used for boils, carbuncles, scrofulous sores, etc.
	Calx Sulphurata	—	$\frac{1}{10}$ to 1 gr.	
CALX Lime CaO	—	—	—	Used externally as a caustic, and for making Calcis Hydras.
	Calcis Hydras	—	—	
CALX CHLORINATA Chlorinated Lime $CaOCl_2$ (?)	—	—	—	Disinfectant.
	Liq. Calcis Chloratæ	1 in 10	—	Used as a disinfectant and stimulant application to various foul ulcers, and in cases of fœtid discharges.
	Vapor Chlori	—	—	Stimulant, antiseptic, and disinfectant inhalation in gangrene of the lungs, phthisis, chronic bronchitis, etc.
CRETA Chalk $CaCO_3$	—	—	—	Used for making Creta Præparata and carbonic acid gas.
CRETA PRÆPARATA Prepared Chalk	—	—	10 to 60 grs.	Antacid and astringent; used in acidity with diarrhœa.
	Hydrarg. cum Creta	2 pts. in 3	3 to 8 grs.	Alterative and laxative.
	Mist. Cretæ	1 pt. in 32	1 to 2 ozs.	Same as Cretæ Præparata.
	Pulv. Cretæ Aromat.	1 pt. in 4	10 to 60 grs.	Antacid and aromatic astringent.
	Pulv. Cretæ Ar. cum Opio	1 pt, in 4 nearly	10 to 40 grs.	Antacid, aromatic astringent and sedative.

PREPARATION.

Chalk.

Is native friable carbonate of lime.

Prepared Chalk.

Chalk freed from most of its impurities by elutriation and afterwards dried in small cone-shaped masses.

From **Chalk** are prepared :—

1. **Lime.**

By calcination, to expel the carbonic acid ($CaCO_3 = CaO + CO_2$).

2. **Chloride of Calcium.**

By neutralising it with hydrochloric acid ($2HCl + CaCo_3 = CaCl_2 + H_2O + CO_2$). A little solution of chlorinated lime and slaked lime are added to the solution in order to peroxidise, and so precipitate, any iron which may be present. The solution is then filtered to remove the insoluble peroxide of iron, evaporated until it becomes solid, and the salt finally dried at about 400°, to obtain it anhydrous.

From the **Chloride** is prepared :—

Precipitated Carbonate of Calcium.

Dissolve chloride of calcium (5 ozs.) and carbonate of sodium (13 ozs.) in boiling distilled water (2 pints each), ($CaCl_2 + Na_2CO_3 = CaCO_3 + 2NaCl$); collect the precipitate of carbonate of calcium, which results on mixing these solutions, on a calico filter, and wash away the chloride of sodium with boiling distilled water until the washings cease to give a precipitate with nitrate of silver (showing its complete removal); dry the product at a temperature of 212°.

From **Lime** is prepared :—

Slaked Lime.

Place lime (2 pounds) in a metal vessel, pour distilled water (1 pint) upon it, and when vapour ceases to be disengaged, cover the vessel and set it aside to cool. When the temperature has fallen to that of the atmosphere, sift the product, and preserve it in well-stoppered bottles.

From **Slaked Lime** are prepared :—

1. **Chlorinated Lime.**

By exposing it to the action of chlorine gas as long as the latter is absorbed :—

$$2CaH_2O_2 + 2Cl_2 = CaCl_2,CaCl_2O_2 + 2H_2O.$$

2. **Hypophosphite of Calcium.**

By heating it with phosphorus and water until phosphuretted hydrogen ceased to be evolved :—

$$3Ca2HO + P_8 + 6H_2O = 3(Ca2PH_2O_2) + 2PH_3,$$

then filtering the liquid, separating uncombined lime with carbonic acid gas, and evaporating the remaining solution until the salt separates in a crystalline condition.

From **Sulphate of Calcium** is prepared :—

Sulphurated Lime ; or, **Sulphide of Calcium.**

Take sulphate of calcium in fine powder (7 ozs.), and mix thoroughly with wood charcoal also in fine powder. Heat to redness in an earthen crucible until the black colour has disappeared. Keep in stoppered bottle.

From **Bone-ash** is prepared :—

Phosphate of Calcium.

Digest it (4 ozs.) in hydrochloric acid (6 ozs.) diluted with water (1 pint) until it is dissolved ; the carbonate of calcium is thus converted into chloride of calcium, and the phosphate into superphosphate ($Ca_32PO_4 + 4HCl = CaH_42PO_4 + 2CaCl_2$). Filter the solution if necessary ; add water (1 pint), and afterwards solution of ammonia (12 ozs.), until the mixture becomes alkaline ; tribasic phosphate of calcium is thus precipitated :—

$$CaH_42PO_4 + 2CaCl_2 + 4NH_4HO = Ca_32PO_4 + 4NH_4Cl + 4H_2O.$$

Having collected the precipitate on a calico filter, wash it, in order to remove the chloride of ammonium, with boiling distilled water as long as the liquid which passes through occasions a precipitate when dropped into solution of nitrate of silver acidulated with nitric acid. Dry the washed product at a temperature not exceeding 212°.

CHARACTERS AND TESTS.

Calcii Carbonas Precipitata.

A white crystalline powder, insoluble in water, dissolving in hydrochloric acid with effervescence, and thus distinguished from the sulphate of calcium, which has been sold for it. The solution, when neutralised by ammonia, lets fall on the addition of oxalate of ammonium a copious white precipitate of calcic oxalate ($CaC_2O_4,2H_2O$). With dilute nitric acid it gives a clear solution which, if perfectly neutral and deprived of carbonic acid by boiling, is not precipitated by saccharated solution of lime (absence of phosphates), or by solution of nitrate of silver (absence of chlorides).

Calcii Chloridum.

In white semi-transparent agglutinated masses, dry, but very deliquescent, with a bitter acrid saline taste. Evolves no chlorine or hypochlorous acid on addition of hydrochloric acid, and is thus distinguished from calx chlorata. It is entirely soluble in twice its weight of water, from which it can be crystallised in prisms; it is soluble also in alcohol. The aqueous solution does not yield a precipitate on addition of lime-water (absence of carbonic acid, and freedom from iron, alumina, etc.).

Calcii Hydras.

Is whiter than quicklime. It may be obtained in crystals from its aqueous solution. [*Vide* "CALX."]

Calcii Hypophosphis.

A white crystalline salt, with a pearly lustre and a bitter nauseous taste. Insoluble in rectified spirit. Soluble in six parts of cold water, and only slightly more soluble in hot water. The crystals do not lose water when heated to 300°. Heated to redness it is decomposed, evolving spontaneously inflammable phosphuretted hydrogen, and leaving a reddish coloured residue, calcic pyrophosphate, amounting to about 80 per cent. of the salt :—

$$2(Ca2PH_2O_2) = Ca_2P_2O_7 + 2PH_3 + H_2O.$$

Calcii Phosphas.

A light white amorphous powder, insoluble in water, but soluble without effervescence (absence of carbonic acid) in dilute nitric acid. The solution continues clear when an excess of acetate of sodium is added to it, but lets fall a white precipitate on the subsequent addition either of a little oxalate of ammonium (presence of lime), or of perchloride of iron (presence of phosphoric acid). In this test the acetate of sodium is added to neutralise the nitric acid, in which oxalate of lime and phosphate of iron are soluble. Ten grains dissolve perfectly and without effervescence in dilute hydrochloric acid, and the solution yields with ammonia a white precipitate (tricalcic phosphate), insoluble in boiling solution of potash, and weighing 10 grains when washed and dried. If alumina were present, it would be dissolved by the potash solution, and there would be a corresponding loss of weight in the residue.

Calcii Sulphas.

Native sulphate of calcium ($CaSO_4,2H_2O$), rendered nearly anhydrous by heat.

Calx.

In compact masses of a whitish colour and of a caustic taste, which readily absorb water, and which, when rather less than their weight of water is added, crack and fall into powder (CaH_2O_2 = Calcis Hydras, slaked lime), with development of much heat. About 11 grains are dissolved by a pint of water at 60°; it is less soluble in boiling water; at 32° water takes up twice as much lime as at 212°. Sugar and glycerine both increase the solubility of lime. The powder obtained by the process of slaking, when agitated with distilled water gives after filtration a clear solution, which has an alkaline reaction, and yields a white precipitate with oxalate of ammonium. The powder obtained by slaking dissolves, without much residue, and without effervescence (absence of carbonic acid), in diluted hydrochloric acid; and if the solution thus formed be evaporated to dryness, and the residue redissolved in water, only a very scanty precipitate forms on the addition of saccharated solution of lime showing the absence of all but traces of magnesia, alumina, or of phosphates.

Calx Chlorinata.

A dull white powder, with a feeble odour of chlorine and an acrid bitter taste. On exposure to air it gives off chlorine, and is converted into chloride and carbonate of calcium. It is partially soluble in water. The solution evolves chlorine copiously on the addition of oxalic acid, and deposits at the same time oxalate of lime. The bleaching properties of calx chlorata depend on the evolution of chlorine, and the test for its purity consists in determining the amount of chlorine which can be set free by acids from a given weight of it. The test is as follows:—5 grains, mixed with 15 grains of iodide of potassium, and dissolved in 4 fluid ounces of water, produce, when acidulated with 2 fluid drachms of hydrochloric acid, a reddish solution, which requires for the discharge of its colour at least 467 grain-measures of the volumetric solution of hyposulphite of sodium, corresponding to 33 per cent. of chlorine liberated by hydrochloric acid. In this test chlorine is liberated by hydrochloric acid. The free chlorine in contact with the iodide of potassium liberates an equivalent amount of iodine, which dissolves in the excess of iodide of potassium, forming a red solution. The amount of free iodine is now determined by ascertaining how much hyposulphite of sodium is required to discharge the red colour—colourless iodide and tetrathionate sodium being formed.

Calx Sulphurata.

A nearly white powder with an odour like that of sulphuretted hydrogen. If 8 grains be added to a cold solution of 14 grains of sulphate of copper in an ounce of water, a little hydrochloric acid be added, and the mixture be then well stirred and heated to a temperature approaching that of ebullition until all action has ceased, the filtered liquid should give no red colour with ferrocyanide of potassium.

Creta Præparata.

A white minutely crystalline powder, effervescing with acids (carbonic acid), and dissolving with only a slight residue (silica) in dilute hydrochloric acid. The solution, when supersaturated with solution of ammonia, gives, upon the addition of oxalate of ammonium, a copious white precipitate of oxalate of calcium. The salt ($CaCl_2$) formed by dissolving the prepared chalk in hydrochloric acid, if rendered neutral by evaporation to dryness, and redissolved in water, gives only a very scanty precipitate on the addition of saccharated solution of lime (absence of all but traces of magnesia, alumina or of phosphates).

COMPOUND OF CERIUM. [Ce=92.]

Name.	B. P. Preps.	Strength.	Dose.	Action and Use.
Cerii Oxalas Oxalate of Cerium $CeC_2O_4.3H_2O$	—	—	1 to 2 grs.	Local sedative; nervine tonic. Used in irritable condition of stomach, in vomiting of pregnancy, etc. Given also in chorea, epilepsy, nervous cough, and nervous palpitation of heart.

PREPARATION.

Oxalate of Cerium.

May be obtained as a precipitate by adding solution of oxalate of ammonium to a soluble salt of cerium, as the chloride.

CHARACTERS AND TESTS.

Cerii Oxalas.

A white granular powder, insoluble in water, decomposed at a dull red heat into a reddish-brown powder, consisting of the oxides of cerium (CeO and Ce_2O_3); this residue dissolves completely in hydrochloric acid, without effervescence (absence of earthy oxalates and of carbonates), and the resulting solution gives with solution of sulphate of potassium a white crystalline precipitate of double sulphate of potassium and cerium (K_2Ce2SO_4). If the salt be boiled with solution of potash, and filtered, the filtrate is not affected by solution of chloride of ammonium (absence of alumina, lead or silver); but when supersaturated with acetic acid it gives with chloride of calcium a white precipitate of oxalate of lime, which is soluble in hydrochloric acid (test for oxalic acid). 10 grains, when incinerated, lose 5·2 grains in weight.

COMPOUND OF COPPER. [Cu=63·5.]

Name.	B. P. Preps.	Strength.	Dose.	Action and Use.
CUPRI SULPHAS Sulphate of Copper; Blue Stone or Blue Vitriol $CuSO_4.5H_2O$	—	—	¼ to 2 grs. astringent and tonic; 5 to 10 grs. emetic	In small doses astringent to alimentary canal, and after absorption a nervine tonic; used in diarrhœa, dysentery, chorea and epilepsy. In large doses, acts as emetic, and is given as such in narcotic poisoning. Externally applied to ulcers, and as a lotion to diminish mucous secretions.
CUPRI NITRAS Nitrate of Copper $Cu2NO_3,3H_2O$	—	—	—	As caustic to syphilitic ulcers on tongue or fauces.

PREPARATION.

Nitrate of Copper.

By dissolving metallic copper in dilute nitric acid and evaporating the solution until crystallisation takes place on cooling to a temperature not lower than 70° F.

Sulphate of Copper.

By heating sulphuric acid and copper together, dissolving the product in water, and evaporating till crystals form on cooling ($Cu+2H_2SO_4=CuSO_4+2H_2O+SO_2$). On a large scale, it is prepared by roasting copper pyrites.

CHARACTERS AND TESTS.

Cupri Nitras.

Deep blue prismatic crystals, very deliquescent, highly corrosive. A diluted aqueous solution is only faintly acid to litmus; gives a maroon-red precipitate with ferrocyanide of potassium; affords a violet blue solution with excess of ammonia; and on the addition of two or three crystals of sulphate of iron and a few drops of sulphuric acid, yields a black zone round the crystals.

Cupri Sulphas.

In oblique prismatic crystals of a clear blue colour, soluble in water, and reddening litmus. Has a strong styptic metallic taste. Effloresces slightly in dry air. At 212° it loses four molecules of water, and at 400° it loses all its water of crystallisation. Anhydrous sulphate of copper is white, but immediately becomes blue on meeting with moisture; hence its use as a test for the presence of water in absolute alcohol. Solution of sulphate of copper gives with chloride of barium a white precipitate of barium sulphate, insoluble in hydrochloric acid, and a maroon-red precipitate of cupric ferro-cyanide with yellow prussiate of potash. If an aqueous solution of the salt be mixed with twice its volume of solution of chlorine, and solution of ammonia be added, the precipitate formed by the first addition of the ammonia will be dissolved by a further and sufficient addition of the alkali, and a violet-blue solution will be produced, leaving nothing undissolved. The foregoing is a test for the presence of iron; the chlorine peroxidises iron, if it be present, and the ammonia in excess dissolves the cupric hydrate, which is at first thrown down; but if any iron, ferric oxide, be present, a reddish-brown precipitate is left undissolved. Fixed alkalies precipitate cupric hydrate, which is insoluble in excess of the precipitant.

IRON AND ITS COMPOUNDS. [Fe=56.]

Name.	B. P. Preps.	Strength.	Dose.	Action and Use.
FERRI ACETAS Acetate of Iron $Fe_26C_2H_3O_2$	—	—		Tonic.
	Liq. Ferri Acetatis Fortior			
	Liq. Ferri Acetatis	1 in 4	5 to 30 mins.	
	Tinctura Ferri Acetatis	1 in 4	5 to 30 mins.	
FERRI ARSENIAS Arseniate of Iron $Fe_3As_2O_8$	—	—	$\frac{1}{16}$ to $\frac{1}{2}$ gr.	Therapeutically identical with arsenious acid.

IRON AND ITS COMPOUNDS. [Fe=56] (*continued*).

Name.	B. P. Preps.	Strength.	Dose.	Action and Use.
Ferri Carbonas Saccharata	—	—	5 to 20 grs.	A mild non-astringent hæmatinic. Used in anæmic amenorrhœa, and in neuralgia.
Saccharated Carbonate of Iron $FeCO_3$	Pil. Ferri Carbonatis	1 pt. in 1¼	5 to 20 grs.	
Ferri et Ammonii Citras	—	—	5 to 10 grs.	Very slightly astringent hæmatinic.
Citrate of Iron and Ammonium	Vinum Ferri Citratis	8 grs. in 1 oz.	1 to 4 drms.	
Ferri et Quininæ Citras Citrate of Iron and Quinine	—	—	5 to 10 grs.	Possesses the properties of iron with those of quinine.
Ferri Perchloridum	—	—	—	Used locally as a caustic and powerful styptic. General tonic and hæmatinic, and also astringent and styptic.
Perchloride of Iron Fe_2Cl_6	Liq. Fortior	—	—	
	Liquor	1 in 4	10 to 30 mins.	
	Tinctura	1 in 4	10 to 30 mins.	
Ferri Pernitras	—	—	—	Astringent and tonic; useful in chronic diarrhœa and chronic mucous discharge.
Pernitrate of Iron Fe_26NO_3	Liq. Ferri Pernitratis	—	10 to 40 mins.	
Ferri Peroxidum Hydratum	—	—	5 to 30 grs.	Non-irritating; useful when it is desired to continue iron for a long period. Much used in neuralgias.
Hydrated Peroxide, or Sesquioxide, or Red Oxide of Iron $Fe_2O_3.H_2O$	Emplastrum Ferri	1 pt. in 11	—	Used as a mechanical support.
Ferri Persulphas	—	—	—	Used for making several pharmacopœial preparations of iron.
Persulphate of Iron Fe_23SO_4	Liq. Ferri Persulphatis	—	—	
Ferri Phosphas	—	—	5 to 10 grs.	Given in diabetes and in rickets, etc.
Phosphate of Iron $Fe_3P_2O_8$	Syrupus Ferri Phosphatis	1 gr. in 1 drm.	1 drm.	
Ferri Sulphas Sulphate of Iron, or Green Vitriol $FeSO_4.7H_2O$	—	—	1 to 5 grs.	Locally styptic, astringent, and irritant. Internally tonic, astringent and hæmatinic. Contained in Pil. Aloes et Ferri, and used in making Mist. Ferri Co.

IRON AND ITS COMPOUNDS. [Fe=56] (*continued*).

Name.	B P. Preps.	Strength.	Dose.	Action and Use.
	Ferri Sulphas Exsiccata	—	½ gr. to 3 grs.	Similar to the sulphate.
	Ferri Sulphas Granulata	—	1 to 5 grs.	Ditto.
	Solution of (App. II.)	10 grs. to 1 oz.	—	Test for nitric acid, etc.
Ferri Sulphidum Sulphide of Iron FeS	—	—	—	Used for production of sulphuretted hydrogen (App. I.).
Ferrum Redactum Reduced Iron	—	—	1 to 5 grs.	Non-astringent hæmatinic.
	Trochisci	1 gr. in each	1 to 6	Non-astringent hæmatinic. Adapted for children.
Ferrum Tartaratum Tartarated Iron, or Potassio-tartrate of Iron	—	—	5 to 10 grs.	Very slightly astringent hæmatinic.

PREPARATION.

From wrought-iron wire (**Ferrum**) are prepared :—

1. **Syrup of Iodide of Iron.**

Put iron (1 oz.), iodine (2 oz.), and distilled water (3 oz.) into a flask, and having heated the mixture gently for about ten minutes, raise the heat and shake occasionally until the froth becomes white, showing that all the iodine has been taken up. Add two fluid ounces of syrup, made by dissolving 28 oz. of sugar in 10 fluid oz. of distilled water, and boil gently for ten minutes; then filter the liquid while still hot into the remainder of the warm syrup and mix. Sp. gravity of product should be about 1·385.

2. **Sulphate of Iron.**

Pour distilled water (1½ pints) on iron wire (4 oz.), placed in a porcelain capsule; add sulphuric acid (4 oz.), and when the disengagement of hydrogen gas has nearly ceased, boil for ten minutes. Filter now through paper, and, after the lapse of twenty-four hours, separate the crystals which have been deposited from the solution. Let these be dried on filtering paper placed on porous bricks, and preserved in a stoppered bottle ($Fe + H_2SO_4 = FeSO_4 + H_2$). When cold dilute sulphuric acid acts on metals, hydrogen is liberated; but when the hot or strong acid is used, sulphurous anhydride is disengaged.

Dried Sulphate of Iron is prepared by exposing sulphate of iron to a heat commencing at 212°, and finally raised to 400°, until aqueous vapour is no longer given off. The residue is pulverised and preserved in stoppered bottles. At a higher temperature sulphuric acid is given off.

Granulated Sulphate of Iron is made by filtering a boiling solution of sulphate of iron, prepared as above, into rectified spirit (8 oz.), stirring the mixture so that the salt shall separate in minute granular crystals. These, being deprived of adhering liquid by decantation, are transferred on filtering paper to porous tiles, and dried by exposure to air.

3. **Perchloride of Iron.** [*Vide* "LIQUORS."]

4. **Pernitrate of Iron.** [*Vide* "LIQUORS."]

From the **Sulphate** are prepared :—

1. **Carbonate of Iron (Saccharated).**

Dissolve sulphate of iron (2 oz.) and carbonate of ammonium ($1\frac{1}{4}$ oz.) in boiling distilled water ($\frac{1}{2}$ gallon each), and mix the two solutions, with brisk stirring, in a deep cylindrical vessel, which is then to be covered as accurately as possible. Set the mixture by for twenty-four hours, and from the precipitate (carbonate of iron) which has subsided, separate the supernatant solution (sulphate of ammonium) by a syphon. Pour on more boiling distilled water (1 gallon), stir well, and, after subsidence, again remove the clear solution. Collect the precipitate on a calico filter, and having first subjected it to expression, rub it with sugar (1 oz.) in a porcelain mortar. Finally, dry at a temperature not exceeding 212°. Boiling water is used in this process to exclude air. Notwithstanding all precautions a little peroxide of iron is unavoidably formed. The object of the sugar is as a preservative against atmospheric oxidation.

2. Arseniate of Iron.

Dissolve sulphate of iron (20¾ oz.) in about 6 pints of distilled water, and arseniate of sodium (15¾ oz., dried at a temperature of 300° F.) in about 5 pints of water; mix the two solutions, adding bicarbonate of sodium (4½ oz.) dissolved in a little water, and stir thoroughly. Collect the white precipitate which forms on a calico filter, and wash until the washings cease to be affected by a dilute solution of chloride of barium. Subject the washed precipitate to pressure between folds of linen and dry in a warm air-chamber at a temperature of not over 100° F.

3. Phosphate of Iron.

Dissolve sulphate of iron (3 oz.) in 30 oz. of boiling water, and phosphate of sodium (2¾ oz.) in a like quantity. When the solutions have cooled to between 100° and 130° F., mix them, adding at the same time bicarbonate of sodium (¾ oz.) dissolved in a little distilled water. Transfer the precipitate to a calico filter and wash with hot distilled water till the filtrate ceases to give a precipitate with chloride of barium. Finally dry the precipitate at a temperature not exceeding 120° F.

4. Persulphate of Iron. [*Vide* "LIQUORS."]

From the **Peroxide** are prepared :—

1. Citrate of Iron and Ammonium.

In the preparation of this substance, moist peroxide of iron is first prepared as follows :—Mix solution of ammonia

(16 oz.) with distilled water (2 pints), and to this add gradually solution of persulphate of iron (10 oz.), previously diluted with distilled water (2 pints), stirring them constantly and briskly. Let the mixture stand for two hours, stirring it occasionally; then put it on a calico filter, and when the liquid has drained away, wash the precipitate (ferric hydrate) with distilled water until that which passes through the filter ceases to give a precipitate with chloride of barium, indicating complete removal of the sulphate of ammonium. Dissolve now citric acid (4 oz.) in distilled water (4 oz.), and having applied the heat of a water-bath, add the ferric hydrate previously well drained, and stir them together until the whole or nearly the whole of the hydrate has dissolved, acid citrate of peroxide of iron being thus formed. Let the solution cool; then add solution of ammonia (5½ oz.). Filter through flannel; evaporate to the consistence of syrup, and dry it in thin layers on flat porcelain or glass plates at a temperature not exceeding 100°, to avoid decomposition. Remove the dry salt in flakes and keep in a stoppered bottle.

2. Citrate of Iron and Quinine.

The first stage in the process is the formation of moist peroxide of iron, as above (using, however, 8 oz. of solution of ammonia and 4½ oz. of solution of persulphate of iron). Quinine is then precipitated from its sulphate by mixing the latter (1 oz.) with distilled water (8 oz.), adding diluted sulphuric acid (12 drms.), and, when the salt is dissolved, precipitating the quinine with slight excess of solution of ammonia. Collect the precipitate in a filter, and wash it with distilled water (1½ pint). Dissolve now citric acid (3 oz.) in distilled water (5 oz.), and, having applied the heat of a water-bath, add the oxide of iron, previously well drained; stir them together, and when the oxide has dissolved, add the precipitated quinine, continuing the agitation until this also has dissolved. Let the solution cool, then add in small quantities at a time solution of ammonia (12 drms.) diluted with distilled water (2 oz.), stirring the solution briskly, and allowing the quinine which separates with each addition of ammonia to dissolve before the next addition is made. Filter the solution, evaporate it to the consistence of a thin syrup, then dry it in thin layers on flat porcelain or glass plates at a temperature of 100°. Remove the dry salt in flakes, and keep it in a stoppered bottle.

The produce is a triple citrate of iron, quinine, and ammonium, the iron existing in both a ferrous and ferric state.

3. Tartarated Iron.

The first stage in the process is the formation of moist peroxide of iron as in the previous two other "scale" preparations of iron (using, however, 11 oz. of solution of ammonia and 6 oz. of solution of persulphate of iron). Mix the washed and drained precipitate intimately with acid tartrate of potassium (2 oz.) in a porcelain dish, and let the mixture stand for twenty-four hours; then, having applied a gentle heat not exceeding 140°, add gradually distilled water (1 pint), and stir constantly until nothing more will dissolve; filter; evaporate at a temperature not exceeding 140° to the consistence of a syrup, and dry it in thin layers on flat porcelain or glass plates in a drying closet at 100°. Remove the dry salt in flakes, and keep it in stoppered bottles.

In this process the acid tartrate of potassium is converted into a neutral dibasic salt by the combination of an equivalent of peroxide of iron.

4. Reduced Iron.

Introduce peroxide of iron (1 oz.) into a gun-barrel, confining it to the middle part of the tube by plugs of asbestos. Pass the gun-barrel through a furnace, and when it has been raised to a strong red heat, cause it to be traversed by a stream of hydrogen gas developed by the action on zinc of some sulphuric acid diluted with eight times its volume of water. The gas, before entering the gun-barrel, must be rendered quite dry by being made to pass first through some more sulphuric acid, and then through a tube eighteen inches long, packed with minute fragments of the chloride of calcium. The farther end of the gun-barrel is to be connected by a cork with a bent tube dipping under water; and when the hydrogen is observed to pass through the water at the same rate that it bubbles through the sulphuric acid, the furnace is to be allowed to cool down to the temperature of the atmosphere, the current of hydrogen being still continued. The reduced iron is then to be withdrawn, and enclosed in a dry stoppered bottle.

$$Fe_2O_3 + 3H_2 = Fe_2 + 3H_2O.$$

In this process some magnetic oxide is also formed :—

$$3Fe_2O_3 + H_2 = H_2O + 2Fe_3O_4.$$

The hot metal is very prone to oxidation while in a state of minute division; hence the necessity for keeping up the stream of hydrogen gas while the metal is cooling. The temperature during the process should not be too high: otherwise the product will be in agglutinated masses.

From the **Persulphate** is prepared :—

Per oxide ofIron.

Mix solution of persulphate of iron (4 oz.) with distilled water (1 pint), and add this gradually to solution of soda (33 oz.), stirring constantly and briskly. Let the mixture stand for two hours, stirring it occasionally; then put it on a calico filter, and when the liquid has drained away, wash the precipitated ferric hydrate with distilled water until what passes through the filter ceases to give a precipitate with chloride of barium. Dry it at a temperature not exceeding 212° F. until it ceases to lose weight, then reduce it to fine powder.

CHARACTERS AND TESTS.

Ferri Arsenias.

At the moment of its precipitation is white, but rapidly changes to a gray or greenish colour, owing to oxidation and formation of a mixed arseniate. It is a tasteless amorphous powder, insoluble in water, but soluble in hydrochloric acid. This solution gives a copious light-blue precipitate with yellow prussiate of potash (persalt of iron), and a still more abundant one of a deeper colour with red prussiate of potash (protosalt of iron), showing the presence of both ferrous and ferric salts. A small quantity boiled with an excess of caustic soda, and filtered, forms oxide of iron, which gives, when exactly neutralised by nitric acid, a characteristic brick-red precipitate (arseniate of silver, Ag_3AsO_4) on the addition of solution of nitrate of silver. When thrown on live coals, it emits the garlic-like odour of arsenic. The solution in hydrochloric acid, when diluted, gives no precipitate with chloride of barium (absence of sulphate). One hundred grains, dissolved in an excess of hydrochloric acid diluted with water, continue to give a blue precipitate with ferricyanide of potassium, until at least 225 grain-measures of the volumetric solution of bichromate of potassium have been added.

Ferri Carbonas Saccharata.

Consists of carbonate of protoxide of iron mixed with peroxide of iron and sugar, the carbonate forming at least 37 per cent. of the mixture ; the proportion of carbonate varies greatly in commercial specimens. There is no carbonate of peroxide of iron. When first precipitated carbonate of iron is white, but it rapidly darkens in colour owing to oxidation ; it is met with in small coherent lumps of a gray-brown colour with a sweet, very feeble, chalybeate taste. Dissolves with effervescence in warm hydrochloric acid diluted with half its volume of water, and the solution gives a slight precipitate with chloride of barium (the sulphate of ammonium not being completely washed away in its preparation). Thirty grains, dissolved in excess of hydrochloric acid and diluted with water, continue to give a blue precipitate with ferricyanide of potassium, until at least 287·5 grain-measures of the volumetric solution of bichromate of potassium have been added.

Ferri et Ammonii Citras.

In thin transparent scales of a deep red colour, slightly sweetish and astringent in taste; feebly reddens litmus paper; is soluble in water, almost insoluble in spirit, except when greatly diluted. Gives a copious blue precipitate with yellow prussiate of potash (presence of peroxide), but no precipitate with the red prussiate (absence of protoxide). Heated with solution of soda it evolves ammonia and deposits peroxide of iron. The alkaline solution from which the iron has separated does not, when slightly supersaturated with acetic acid, give any crystalline deposit; thus distinguishing it from tartarated iron. When incinerated with exposure to air, it leaves not less than 30 per cent. of peroxide of iron, which is not alkaline to litmus. Tartarated iron, when incinerated, leaves a mixture of peroxide of iron, carbon, and carbonate of potassium.

Ferri et Quininæ Citras.

In thin scales of a greenish golden-yellow colour, somewhat deliquescent, and entirely soluble in cold water. The solution is very slightly acid, and is precipitated reddish-brown by solution of soda, the precipitate consisting of hydrated peroxide of iron mixed with quinine; with solution of ammonia it gives a white precipitate of quinine; it gives a blue precipitate with both yellow and red prussiate of potash, showing the presence of both per- and protosalts of iron; with tannic acid it gives a grayish-black precipitate of tannate of iron with quinine. Its taste is bitter as well as chalybeate. When burned with exposure to air, it leaves a residue which when moistened with water is not alkaline to test-paper, showing absence of potash. 50 grains dissolved in an ounce of water and treated with a slight excess of ammonia give a white precipitate of quinine, which, when collected on a filter and dried, should weigh 7½ grains. The precipitate is almost entirely soluble in pure ether, showing the absence of cinchonine and quinidine, and when burned leaves but a minute residue. The proportion of quinine present in commercial samples is liable to vary considerably. It spoils by long exposure to light and becomes less soluble.

Ferri Peroxidum Hydratum.

A reddish-brown powder, tasteless, not magnetic, dissolves completely, though slowly, with the aid of heat, in hydrochloric acid diluted with half its volume of water, forming a solution which gives a copious blue precipitate with yellow, but not with red prussiate of potash, proving the presence of peroxide and absence of protoxide of iron. Heated to dull redness in a test-tube, it gives off moisture, and is converted into the anhydrous form.

Ferri Phosphas.

A slate-blue amorphous powder, insoluble in water; soluble in hydrochloric acid. The solution yields a precipitate with both yellow and red prussiate of potash, that afforded by the latter being more abundant, indicating more protosalt than persalt. When its solution is treated with tartaric acid and an excess of ammonia, and subsequently with ammonio-sulphate of magnesium, it lets fall a crystalline precipitate of triple phosphate ($MgNH_4PO_4,6H_2O$). The solution must be rendered alkaline, else the triple phosphate would not be formed. The tartaric acid prevents the precipitation of oxide of iron by the ammonia. If it is digested in hydrochloric acid with a lamina of pure copper, a dark deposit (arsenicum) does not form on the metal; thus distinguishing it from arseniate of iron. 30 grains dissolved in hydrochloric acid continue to give a blue precipitate with red prussiate of potash until at least 279 grain-measures of the volumetric solution of bichromate of potassium have been added.

Ferri Sulphas.

In oblique rhombic prisms, which are of a pale greenish-blue colour when free from persulphate, but which are of a rich green colour when the latter salt is present. The crystals are slightly efflorescent; at 400° they lose six equivalents o water (*Ferri Sulphas Exsiccata*), and at a red heat they are decomposed. Sulphate of iron has a styptic taste; it is soluble in water, but insoluble in rectified spirit if free from persulphate. This insolubility in spirit is utilised for the preparation of the *Ferri Sulphas Granulata.* On exposure to air, the crystals absorb oxygen and become brown, from formation of persulphate; their aqueous solution readily absorbs oxygen, and deposits a rust-coloured sediment of basic sulphate ($Fe_4O_5SO_4$). Solution of sulphate of iron gives a white precipitate with chloride of barium, being the test for a sulphate; with ferri-cyanide of potassium it gives a blue precipitate, and with ferro-cyanide of potassium it gives an almost white or light blue precipitate, if it is nearly free from persulphate. It gives no precipitate with sulphuretted hydrogen, showing the absence of copper. *Granulated Sulphate of Iron* occurs in small, pale greenish-blue granular crystals. In other respects it corresponds to the characters and tests for sulphate of iron.

Ferrum Redactum.

Is metallic iron with a variable amount of magnetic oxide of iron. It occurs as a fine grayish-black powder, strongly attracted by the magnet, and exhibiting metallic streaks when rubbed with firm pressure in a mortar. It dissolves in hydrochloric acid with the evolution of hydrogen, and the solution gives a light blue precipitate with yellow prussiate of potash, showing the absence of peroxide. 10 grains added to an aqueous solution of 50 grains of iodine and 50 grains of iodide of potassium, and digested with them in a small flask at a gentle heat, leave not more than 5 grains undissolved, which should be entirely soluble in hydrochloric acid. In this test the metallic iron alone is dissolved, the magnetic oxide being insoluble in the iodine solution ; the solubility of the magnetic oxide in hydrochloric acid shows the absence of silica and mechanical impurities. Reduced iron may contain some sulphide of iron.

Ferrum Tartaratum.

Thin, transparent scales of a deep garnet colour, slightly deliquescent, somewhat sweet, and rather astringent ; soluble in water, and, although a persalt, sparingly soluble in spirit. The aqueous solution, when acidulated with hydrochloric acid, gives a copious blue precipitate with yellow prussiate of potash, but no precipitate with red prussiate of potash, indicating the presence of a persalt and absence of a protosalt. When the salt is boiled with solution of soda, peroxide of iron separates, but no ammonia is evolved, by which it is distinguished from the citrate of iron and ammonium ; the filtered solution, which contains tartrate of potassium and soda, when slightly acidulated by acetic acid, gives as it cools a crystalline deposit of acid tartrate of potassium, thus :—

$$KNaC_4H_4O_6 + HC_2H_3O_2 = KHC_4H_4O_6 + NaC_2H_3O_2.$$

By incinerating 50 grains of tartarated iron at a red heat, washing what is left with distilled water, and again incinerating, a residue of peroxide of iron is obtained, weighing 15 grains.

MERCURY AND ITS COMPOUNDS. [Hg = 200.]

Mercury or "Quicksilver" is occasionally met with in nature in its metallic state, but more frequently combined with chlorine as "horn mercury," or with silver, forming a native amalgam; and still more abundantly combined with sulphur as sulphide of mercury, or "Cinnabar."

It is chiefly obtained from the latter by distilling it with iron; a sulphate of iron is formed, and the mercury distils over and is condensed. Commercial mercury is purified by redistillation and washing with dilute hydrochloric acid. When pure, it is a brilliant white metallic liquid; it tarnishes slightly on exposure: becomes solid (freezes) at —39°; boils at 662°; above 40° a slight vapour arises from it, and at a heat a little below that of visible redness it entirely volatilises. Its specific heat is low, and it is a good conductor of heat; hence its adaptability in the construction of thermometers. When small globules of it are rolled on a sheet of paper, they should remain spherical and not adhere, thus showing freedom from metallic impurities. Mercury dissolves and forms "amalgams" with many metals—as tin, bismuth, silver, gold, etc. It is not attacked by hydrochloric acid, or by cold sulphuric acid; but boiling sulphuric acid and cold or boiling nitric acid dissolve it, and convert it into their respective salts. It forms two classes of salts—*Mercuric*, or persalts, and *Mercurous*, or protosalts. The following table shows the distinctive tests between these :—

Test.	With *Mercuric Salts.*	With *Mercurous Salts.*
Hydrochloric acid -	No precipitate.	White precipitate.
Solution of potash -	Yellow precipitate.	Black ,,
Iodide of potassium -	Red ,,	Yellowish-green precipitate.
Solution of ammonia -	White ,,	Black precipitate.

Preparations containing Mercury chiefly uncombined.

Hydrargyrum cum Creta	1 part in 3
Emplastrum Ammoniaci cum Hydrargyro	1 „ in 5
„ Hydrargyri	1 „ in 3
Linimentum Hydrargyri	1 „ in 6
Pilula Hydrargyri	1 „ in 3
Suppositoria Hydrargyri	1 „ in 6
Unguentum Hydrargyri	1 „ in 2
„ „ Compositum	1 „ in 4½

Compounds of Mercury.

Name.	B. P. Preps.	Strength.	Dose.	Action and Use.
HYDRARGYRI IODIDUM RUBRUM	—	—	$\frac{1}{32}$ to $\frac{1}{8}$ gr.	Resembles corrosive sublimate in its action, and is given in the same cases. Is much more irritating than the green iodide. Chiefly used externally to enlarged glands, syphilitic periosteal nodes, and in goitre, etc.
Red Iodide or Biniodide of Mercury HgI_2	Unguent. Hyd. Iodidi Rubri	1 pt. in 28	—	
HYDRARGYRI NITRAS	—	—	—	Caustic: applied to acne, lupus, warts, cancerous and other spreading ulcers, etc.
Nitrate of Mercury $Hg2NO_3$	Liq. Hyd. Nitratis Acidus	—	—	
	Unguent. Hydrarg. Nitratis	1 in 15½	—	Alterative, stimulant, and parasiticide. Beneficial in many cutaneous diseases, and (diluted) in ophthalmia tarsi, etc.
	Ung. Hyd. Nit. Dil.	1 in 3 of strong		
HYDRARGYRI OXIDUM FLAVUM Yellow Oxide of Mercury HgO	—	—	—	Use as a local application in chronic inflammation of joints, in skin diseases; also for inunction in syphilis. Is the active ingredient in "yellow wash."
	Hydrargyri Oleatum	28·4 in 100	—	Ditto.
HYDRARGYRI OXIDUM RUBRUM	—	—	—	Used externally as an irritant and escharotic to excrescences, chancres, fungous ulcers, etc.
Red Oxide or Nitric Oxide of Mercury, Red Precipitate HgO	Unguent. Hyd. Oxidi Rubri	1 pt. in 8	—	

Compounds of Mercury (*continued*).

Name.	B. P. Preps.	Strength.	Dose.	Action and Use.
HYDRARGYRI PERCHLORIDUM	—	—	gr. $\frac{1}{16}$—$\frac{1}{8}$	Powerful irritant. In small doses, used as an alterative, in syphilis, scaly skin diseases, periosteal affections, etc. Employed locally as a parasiticide in chronic skin diseases, in chronic mucous discharges, and as a gargle in ulcerated sore throat.
Perchloride or Bichloride of Mercury, Corrosive Sublimate $HgCl_2$	Liq. Hyd. Perchloridi	$\frac{1}{2}$ gr. in 1 oz.	$\frac{1}{2}$ to 2 drms.	
	Lotio Hyd. Flava	18 grs. in 10 ozs.	—	
HYDRARGYRI SUBCHLORIDUM	—	—	$\frac{1}{2}$ to 5 grs.	Produces but little local irritation. Is an alterative and purgative. The compound pill is used as an alterative in chronic skin diseases, and the ointment is used externally in such cases.
Subchloride or Chloride of Mercury, Calomel $HgCl$	Lotio Hyd. Nigra	3 grs. in 1 oz.	5 to 10 grs.	
	Pil. Hyd. Subchloridi Co.	1 pt. in 5	—	
	Unguent. Hyd. Subchloridi	1 pt. in $6\frac{1}{2}$	—	
HYDRARGYRI PERSULPHAS Sulphate of Mercury $HgSO_4$	—	—	—	Not employed medicinally. Used in preparation of Hyd. Perchloridum and Hyd. Subchloridum.
HYDRARGYRUM AMMONIATUM	—	—	—	Not used internally. Externally used to destroy pediculi, and in chronic skin diseases.
Ammoniated Mercury, Ammonio-chloride of Mercury, White Precipitate NH_2HgCl	Unguent. Hyd. Ammoniati	1 pt. in 10	—	

PREPARATION.

From **Mercury** is prepared :—

1. **Nitrate of Mercury.**

Vide "LIQUORES."

2. **Persulphate of Mercury.**

Heat mercury (20 oz.) with sulphuric acid (12 oz.) in a porcelain vessel, stirring constantly until the metal disappears, then continue the heat until a dry white salt remains. During the process abundant fumes of sulphurous acid gas are given off :—

$$Hg + 2H_2SO_4 = HgSO_4 + SO_2 + 2H_2O.$$

Heat is necessary, as cold sulphuric acid does not act on mercury.

From the **Nitrate** is prepared :—

Red Oxide of Mercury.

Dissolve mercury (4 oz.) in nitric acid ($4\frac{1}{2}$ oz.) diluted with water (2 oz.), evaporate the solution to dryness ($3Hg + 8HNO_3 = 3Hg2NO_3 + 2NO + 4H_2O$). With the dry salt (nitrate of mercury) thus obtained triturate mercury (4 oz.) until the two are uniformly blended together. Heat the mixture in a porcelain dish with repeated stirring, until acid vapours cease to be evolved ($Hg2NO_3 + Hg = 2HgO + 2NO_2$).

If nitrate of mercury were heated by itself, red oxide of mercury would be formed, but some oxygen would be wasted, thus :—

$$Hg2NO_3 = HgO + 2NO_2 + O.$$

From the **Persulphate** are prepared :—

1. **Perchloride of Mercury.**

Reduce persulphate of mercury (20 oz.) and dried chloride of sodium (16 oz.) to fine powder, and having mixed them with black oxide of manganese (1 oz.) by trituration in a mortar, subject the mixture to sublimation ($HgSO_4 + 2NaCl = HgCl_2 + Na_2SO_4$). The object of using black oxide of manganese is to prevent the formation of any calomel ; this it does by liberating some chlorine from the chloride of sodium.

2. **Subchloride of Mercury.**

Moisten persulphate of mercury (10 oz.) with some water, and rub it with mercury (7 oz.) until globules are no longer visible. The persulphate of mercury is thus converted into subsulphate ($HgSO_4 + Hg = Hg_2SO_4$). Add dried chloride of sodium (5 oz.), and thoroughly mix the whole by continued trituration ($Hg_2SO_4 + 2NaCl = Na_2SO_4 + 2HgCl$). Sublime into a large chamber, so as to produce a fine powder; wash the sublimate with boiling distilled water until the washings cease to be darkened by a drop of sulphide of ammonium, showing the absence of corrosive sublimate. Finally, dry at a heat not exceeding 212°, and preserve in an opaque bottle.

From the **Perchloride** are prepared:—

1. **Red Iodide of Mercury.**

Dissolve perchloride of mercury (4 oz.) and iodide of potassium (5 oz.), each in boiling distilled water (the former in 3 pints, the latter in 1), and mix the solutions. When the temperature of the mixture has fallen to that of the atmosphere, decant the supernatant liquor from the precipitate, and having collected the latter on a filter, wash it twice with cold distilled water, and dry it at a temperature not exceeding 212° ($HgCl_2 + 2KI = 2KCl + HgI_2$). As the precipitate is soluble in excess either of bichloride of mercury or of iodide of potassium, excess of either of these salts must be avoided in the process.

2. **Yellow Oxide of Mercury.**

Dissolve perchloride of mercury (4 oz.) in distilled water (4 pints) by the aid of heat; add this to solution of soda (2 pints). Stir them together; allow the precipitate to subside; remove the supernatant liquid by decantation; wash the precipitate thoroughly on a calico filter with distilled water, and finally dry it by the heat of a water-bath ($HgCl_2 + 2NaHO = 2NaCl + HgO + H_2O$). In this process the caustic soda must be in excess, hence the mercurial solution is to be added to it, else an oxychloride of mercury would be formed. One part of the oxide dissolved in 9 parts of oleic acid forms the oleate of mercury.

3. Ammoniated Mercury.

Dissolve perchloride of mercury (3 oz.) in distilled water (3 pints) by the aid of a moderate heat. Mix the solution with solution of ammonia (4 oz.), constantly stirring; collect the precipitate on a filter, and wash it with cold distilled water until the liquid which passes through ceases to give a precipitate when dropped into a solution of nitrate of silver acidulated with nitric acid (absence of chloride of ammonium). Lastly, dry the product at a temperature not exceeding 212° ($HgCl_2 + 2NH_3 = NH_2HgCl + NH_4Cl$). If the order of mixing the solutions be reversed, a compound having the composition $NH_2HgCl, HgCl_2$ would be formed.

CHARACTERS AND TESTS.

Hydrargyri Iodidum Rubrum.

A crystalline powder of a vermilion colour, becoming yellow when gently heated over a lamp on a sheet of paper, and becoming red again on friction or after cooling. It is dimorphous, the crystals being rhomboidal prisms in the yellow form, and octahedral in the red form. Sp. gr. 6·3. Almost insoluble in water, sparingly soluble in alcohol, but freely soluble in ether, or in an aqueous solution of iodide of potassium; it is soluble also without change in solutions of alkaline chlorides. With corrosive sublimate it forms a soluble crystallisable double salt, HgI_22HgCl_2. When digested with solution of soda, it assumes a reddish-brown colour, oxide of mercury being separated, and iodide of sodium being formed in solution ($HgI_2 + 2NaHO = HgO + H_2O + 2NaI$); when the fluid is cleared by filtration and mixed with solution of starch, it gives a blue precipitate on being acidulated with nitric acid, iodine being set free ($3NaI + 4HNO_3 = 3NaNO_3 + 2H_2O + NO + I_3$). Red iodide of mercury is entirely volatilised by a heat under redness; sulphide of mercury has been used to adulterate it, but it may be detected by solution of iodide of potassium, which dissolves the iodide, but leaves the sulphide.

Hydrargyri Oxidum Flavum.

Differs only physically from the red oxide. It is a yellow powder, readily dissolved by hydrochloric acid, yielding a solution which with solution of ammonia gives a white precipitate (ammoniated mercury). A cold solution of oxalic acid converts it into oxalate of mercury. It is entirely volatilised when heated to incipient redness, oxygen gas and vapour of mercury being given off. Water boiled with it gives no precipitate with ammonia, or with solution of nitrate of silver, showing the absence of corrosive sublimate. By long exposure to light it acquires a grayish colour, owing probably to its partial reduction to the metallic state.

Hydrargyri Oxidum Rubrum.

An orange-red crystalline powder. Sp. gr. 10·68. Readily dissolved by hydrochloric acid, yielding a solution which, with caustic potash added in excess, gives a yellow precipitate (HgO), and with solution of ammonia a white precipitate (NH_2HgCl). It is readily soluble in nitric, hydrocyanic, and acetic acids, but is unaffected by a cold solution of oxalic acid; it is very slightly soluble in water, alcohol, or ether. Is entirely volatilised by a heat below redness, oxygen gas and vapour of mercury being given off; if it be heated in a test-tube, no orange vapours of NO_2 are perceived, showing the absence of undecomposed subnitrate. By long exposure to light it undergoes partial reduction.

Hydrargyri Perchloridum.

In heavy colourless masses of prismatic crystals, possessing a highly acrid metallic taste. Sp. gr. 5·2. More soluble in alcohol, and still more so in ether (1 in 3) than in water; more soluble in boiling water (1 in 3) than in cold (1 in 16); sal ammoniac greatly increases its solubility in water, and forms with it a stable double salt, *sal alembroth*, $2NH_4Cl$, $HgCl_2$, H_2O. The simple aqueous solution is liable to decomposition, calomel being deposited, and oxygen being evolved. Nitric, sulphuric, and hydrochloric acids dissolve it without decomposition. Its aqueous solution reddens litmus, and gives a yellow precipitate with caustic potash (HgO), a white precipitate with solution of ammonia (NH_2HgCl), and a curdy white precipitate with nitrate of silver ($AgCl$). When heated it sublimes without decomposition, and without leaving any residue (absence of fixed impurities). It is decomposed by most vegetable decoctions and infusions, by many oils, and when boiled with sugar. With albumen it forms albuminate of mercury, which is insoluble in water, but soluble in solution of chloride of sodium; it is thus a powerful antiseptic.

Hydrargyri Subchloridum.

A dull, white, heavy, and nearly tasteless powder. Sp. gr. 9·2. Is rendered yellow by trituration in a mortar. Is insoluble in water, spirit, or ether. Digested with solution of potash, it becomes black from formation of suboxide of mercury ($2HgCl + 2KHO = Hg_2O + 2KCl + H_2O$); it is thus distinguished from white precipitate; the clear solution, acidulated with nitric acid, gives a copious white precipitate with nitrate of silver. Contact with prussic acid darkens its colour, owing to the separation of metallic mercury ($2HgCl + 2HCy = HgCy_2 + 2HCl + Hg$). It is entirely volatilised by heat. Warm ether, which has been shaken up with it in a bottle, leaves on evaporation no residue, showing the absence of perchloride and red oxide of mercury, both of which are soluble in ether.

Hydrargyri Persulphas.

A white crystalline heavy powder. Sp. gr. 6·46. Rendered yellow by effusion of water, being thus converted into an insoluble basic sulphate ($Hg_3O_2SO_4$), called "Turpeth mineral," and a soluble acid salt. Sulphate of mercury is soluble in solution of chloride of sodium; it is entirely volatilised by heat.

Hydrargyrum Ammoniatum.

An opaque white powder with an unpleasant metallic taste. Cold water, alcohol, or ether have no action on it. It is readily soluble in nitric, hydrochloric, and acetic acids, and is thus distinguished from calomel. Digested with caustic potash, it does not blacken, but evolves ammonia, and acquires a yellow colour ($NH_2HgCl + KHO = NH_3 + HgO + KCl$); the fluid, filtered and acidulated with nitric acid, gives a white precipitate with nitrate of silver (presence of chlorine). Boiled with an acid solution of chloride of tin, it becomes gray, and affords globules of metallic mercury ($NH_2HgCl + SnCl_2 + 2HCl = NH_4Cl + SnCl_4 + Hg$). It is entirely volatilised, without fusion, at a heat under redness, showing the absence of fixed impurities. What is known as "fusible white precipitate" (NH_2HgCl, NH_4Cl) contains 14 per cent. less of mercury.

In composition ammoniated mercury corresponds to chloride of ammonium in which two equivalents of hydrogen are replaced by one of diad mercury. It is therefore a chloride of mercur-ammonium.

COMPOUNDS OF LITHIUM [L=7.]

Name.	B. P. Preps.	Strength.	Dose.	Action and Use.
LITHII CARBONAS Carbonate of Lithia L_2CO_3	— Liq. Lithiæ Effervescens	— 10 grs. in 1 pint	3 to 6 grs. 5 to 10 ozs.	Antacid, diuretic. Given in gout, uric-acid gravel, and renal calculus. Externally as a lotion to gouty joints, gouty ulcers, and chalk-stones.
LITHII CITRAS Citrate of Lithia $L_3C_6H_5O_7$	—	—	5 to 10 grs.	Same action and uses as the carbonates, except that it is not a remote antacid, and is more soluble.

PREPARATION.

Carbonate of Lithium.

May be prepared by the action of sulphate or chloride of lithium on carbonate of ammonium.

Citrate of Lithium.

Dissolve citric acid (90 gr.) in warm distilled water (1 oz.); add carbonate of lithia (50 gr.) in successive portions; apply heat until effervescence ceases and a perfect solution is obtained; evaporate by a steam or sand bath until the product has a specific gravity of about 1·230, and set aside for crystals to form. Dry the crystals and preserve them in a stoppered bottle.

CHARACTERS AND TESTS.

Lithii Carbonas.

In white powder, or in minute crystalline grains, alkaline in reaction, soluble in 150 parts of cold water, its solubility being increased by the presence of carbonic acid. Like other carbonates, it is insoluble in alcohol. It dissolves with effervescence in hydrochloric acid; and the solution, evaporated to dryness, leaves a residue of chloride of lithium, which communicates a red colour to the flame of a spirit lamp, and, redissolved in water, yields with phosphate of sodium a precipitate of phosphate of lithium. In this way lithia is distinguished from other alkalies. 10 grains of the salt neutralised with sulphuric acid and afterwards heated to redness leave 14·86 grains of dry sulphate of lithium, which, when redissolved in distilled water, yields no precipitate with oxalate of ammonium or lime-water, showing the absence of lime and magnesia.

Lithii Citras.

A white crystalline salt, deliquescent and soluble in water, without leaving any residue. Heated to redness it blackens, evolving inflammable gases, evidencing the presence of an organic acid; and the residue, neutralised by hydrochloric acid, yields with rectified spirit a solution which burns with a crimson flame. When its solution is boiled with lime-water, it becomes turbid, and clears again on cooling, showing the presence of a citrate. 20 grains of the salt burned at a low red heat, with free access of air, leave 7·8 grains of white residue, consisting of carbonate of lithia.

COMPOUNDS OF MAGNESIUM [Mg=12.]

Name.	B. P. Preps.	Strength.	Dose.	Action and Use.
MAGNESIA PONDEROSA Heavy Calcined Magnesia MgO	—	—	10 to 60 grs.	Antacid and laxative. Given in acidity of stomach with a tendency to constipation; in gouty affections, etc.
MAGNESIA LEVIS Light Magnesia MgO	—	—	10 to 60 grs.	Same action and use as Magnesia. Enters into composition of Pulv. Rhei. Co. (6 pts. in 9).
MAGNESII CARBONAS PONDEROSA	—	—	10 to 60 grs.	Same action and use as Magnesia. Used in preparation of the Trochisci Bismuthi (2½ grs. in each).
Heavy Carbonate of Magnesia $(MgCO_3)_3.Mg(HO)_2.4H_2O$	Liquor Magnesii Carbonatis	10 grs. in 1 oz.	1 to 2 ozs.	
MAGNESII CARBONAS LEVIS Light Carbonate of Magnesia $(MgCO_3)_3.Mg(HO)_2.4H_2O$	—	—	10 to 60 grs.	Same action and use as Magnesia.
MAGNESII CITRAS	—	—	—	Mild saline cathartic.
Citrate of Magnesia $Mg_32C_6H_5O_7$	Liquor Magnesii Citratis	—	5 to 10 ozs.	
MAGNESII SULPHAS	—	—	1 to 4 drms.	Saline purgative. In small doses diuretic. Given in febrile affections, portal congestion, etc. Contained in Mist. Sennæ Co. (1 in 5)
Sulphate of Magnesia or Epsom Salts $MgSO_4.7H_2O$	Enema Magnesii Sulphatis	1 oz. in 16	—	

PREPARATION.

From **Dolomite** (Magnesian limestone) is prepared :—

Sulphate of Magnesium.

Treat the Dolomite, which consists of carbonates of lime and magnesium, with sulphuric acid; a soluble sulphate of magnesium and an insoluble sulphate of calcium are thus formed and are separated. It was formerly prepared from "bittern," the liquor left when chloride of sodium is crystallised from sea-water.

From **Sulphate of Magnesium** are prepared :—

1. **Heavy Carbonate of Magnesium.**

Dissolve sulphate of magnesium (10 oz.) and carbonate of sodium (12 oz.) each in 1 pint of boiling distilled water; mix the two solutions and evaporate the whole to perfect dryness by means of a sand-bath. Digest the residue for half an hour with boiling distilled water (2 pints), and having collected the insoluble matter (carbonate of magnesium) on a calico filter, wash it separately with distilled water until the washings cease to give a precipitate with chloride of barium, showing that the sulphate of sodium is completely removed. Finally dry at a temperature not exceeding 212°, to avoid driving off carbonic acid.

2. **Light Carbonate of Magnesium.**

Dissolve sulphate of magnesium (10 oz.) and carbonate of sodium (12 oz.) in distilled water ($\frac{1}{2}$ gallon each); mix the two solutions cold, and boil the mixture in a porcelain dish for fifteen minutes. Transfer the precipitate to a calico filter, and pour upon it repeatedly boiling distilled water, until the washings cease to give a precipitate with chloride of barium. Lastly, dry by a heat not exceeding 212°. The same reaction takes place as in the preparation of the other carbonate. The difference in the aggregation of the two carbonates depends on the heat employed in their preparation, and on the amount of dilution of the solutions; in the preparation of the light carbonate less heat and a greater degree of dilution are made use of.

From the **Carbonate of Magnesium** are prepared :—

1. **Heavy Magnesia.**

Put carbonate of magnesium (4 oz.) into a Hessian crucible, closed loosely by a lid, and expose it to a low red heat until a small quantity taken from the centre of the crucible, when it has cooled, and dropped into diluted sulphuric acid, causes no effervescence, showing that all the carbonic acid has been driven off.

$$3MgCO_3,Mg2HO = 4MgO + H_2O + 3CO_2.$$

2. **Citrate of Magnesium (Solution of).**

Dissolve citric acid (200 grains) in two ounces of water, and add carbonate of magnesium (100 grains). Stir until dissolved, and filter the solution into a strong half-pint bottle; add syrup of lemons ($\frac{1}{2}$ oz.) and sufficient water to nearly fill the bottle, then introduce crystals of bicarbonate of potassium (40 grains), and immediately close the bottle with a cork which should be secured with wire. Afterwards shake the bottle until the crystals are dissolved.

From the **Light Carbonate of Magnesium** is prepared :—

Light Magnesia.

In the same manner as magnesia is obtained from the carbonate.

CHARACTERS AND TESTS.

Magnesia Ponderosa.

A white powder, almost tasteless; very sparingly soluble in water, but more soluble in cold than in hot water; is readily dissolved by acids, without effervescence, showing the absence of carbonate. Sp. gr. 2·3. Its solution in hydrochloric acid, when neutralised by a mixed solution of ammonia and chloride of ammonium, gives a copious crystalline precipitate when phosphate of soda is added to it, the precipitate being the triple, or ammonio-magnesian, phosphate, $MgNH_4PO_46H_2O$. Placed on moist turmeric paper, magnesia turns it brown. With water it forms a hydrate ($Mg2HO$) without the evolution of heat. Dissolved in nitric acid, and neutralised with a mixture of solution of ammonia and chloride of ammonium, it does not give a precipitate with oxalate of ammonium or chloride of barium, showing the absence of lime or sulphates.

Magnesia Levis.

A bulky white powder, differing from magnesia only in its greater levity, the volumes corresponding to the same weight being to each other in the ratio of three and a half to one.

Magnesii Carbonas Ponderosa.

A white granular powder; very sparingly soluble in water, but more soluble in cold water than in hot. It dissolves with effervescence in the dilute mineral acids, yielding solutions which, when first treated with chloride of ammonium, are not disturbed by the addition of an excess of solution of ammonia (showing the absence of lime), but yield a copious crystalline precipitate of triple phosphate upon the addition of phosphate of sodium. With excess of hydrochloric acid it forms a clear solution, in which chloride of barium causes no precipitate, showing the absence of sulphate. Another portion of the solution, supersaturated with ammonia, gives no precipitate with oxalic acid or with sulphuretted hydrogen, indicating the absence of lime and of metals generally. 50 grains calcined at a red heat are reduced to 22.

Magnesii Carbonas Levis.

A very light powder, which, when examined under the microscope, is found to be partly amorphous, with numerous slender prisms intermixed; the partially crystalline form being due to the slowness of its precipitation. The other characters and tests are the same as those for carbonate of magnesia.

Magnesii Sulphas.

In minute, colourless, transparent, rhombic prisms, isomorphous with sulphate of zinc, from which they are distinguished by their intensely bitter taste, by the precipitate produced with potash being insoluble in excess of the reagent, and by not affording a precipitate with sulphide of ammonium. The crystals slowly effloresce in the air; deliquescence indicates the presence of chloride of magnesium, which may also be detected by yielding a white precipitate with nitrate of silver. Sulphate of magnesium is insoluble in alcohol, but readily dissolves in water, and the solution gives copious white precipitates with chloride of barium and with a mixed solution of ammonia, chloride of ammonium, and phosphate of sodium (triple phosphate). The aqueous solution of sulphate of magnesium at ordinary temperatures should not give a precipitate with oxalate of ammonium, showing the absence of lime; nor should it give a brown precipitate with chlorinated lime or soda, indicating the absence of iron, which would also be detected by giving a blue precipitate with ferrocyanide of potassium. The precipitate of carbonate and hydrate of magnesium given by carbonate of soda, when obtained from a boiling solution of 100 grains of the salt, should, when well washed, dried, and heated to redness, weigh 16·26 grains.

COMPOUNDS OF LEAD. [Pb=207.

Name.	B. P. Preps.	Strength.	Dose.	Action and Use.
Plumbi Acetas Acetate of Lead, Sugar of Lead $Pb(C_2H_3O_2)_2.3H_2O$	—	—	1 to 4 grs.	Astringent and sedative; used in hæmorrhages, chronic diarrhœa, and dysentery; to check sweating and expectoration in phthisis. Externally, applied over inflamed parts. Used in making Liquor Plumbi Subacetatis.
	Pil. Plumbi c. Opio	3 pts. in 4	3 to 5 grs.	
	Suppositoria Plumbi Co.	1 pt. in 5	—	
	Unguent. Plumbi Acetatis	12 grs. in 1 oz.	—	
Plumbi Carbonas Carbonate of Lead $2PbCO_3,PbO,H_2O$	—	—	—	Not used internally. Externally, astringent and sedative to inflamed and excoriated surfaces.
	Unguent. Plumbi Carbonatis	1 pt. in 8	—	
Plumbi Iodidum Iodide of Lead PbI_2	—	—	—	Used externally as a mild stimulant to enlarged scrofulous joints, etc. Seldom given internally.
	Emplastrum Plumbi Iodidum	1 pt. in 10	—	
	Unguent. Plumbi Iodidum	1 pt. in 8	—	
Plumbi Nitras Nitrate of Lead $Pb(NO_3)_2$	—	—	—	Used as a topical application in onychia maligna. In solution, deodorant. Employed in preparation of Plumbi Iodidum.
Plumbi Oxidum Oxide of Lead, Litharge PbO	—	—	—	Not given internally. Used in the preparation of the Emplastrum Cerati Saponis, and both of the Acetates.
	Emplastrum Plumbi	—	—	
Plumbi Subacetas Subacetate of Lead $Pb_2O2C_2H_3O_2$, or $Pb_2C_4H_6O_5$	—	—	—	Astringent and sedative local application.
	Liq. Plumbi Subacetatis	5 ozs. to 1 pt.	—	
	Liq. Plumbi Subacetatis Dilutus	2 drs. to 1 pt.	—	Ditto.
	Unguent. Plumbi Subacet. Co.	1 pt. in 5¾	—	Ditto.
	Glycerinum Plumbi Subacetatis	—	—	Ditto.
	Unguent. Glycerini Plumbi Subacetatis	1 pt. in 38	—	Ditto.

PREPARATION.

From **Lead** are prepared :—

1. Carbonate of Lead.

By exposing lead to the fumes of acetic and carbonic acids from decaying organic matter, tan, vinegar, etc.

2. Oxide of Lead.

By roasting lead in a current of air.

From the **Oxide of Lead** are prepared :—

1. Acetate of Lead.

Mix acetic acid (2 pints) with distilled water (1 pint), add oxide of lead (24 oz.), and dissolve with the aid of a gentle heat. Filter, evaporate till a pellicle forms, and set aside to crystallise, first adding a little acetic acid should the fluid not have a distinctly acid reaction. The addition of acetic acid in slight excess is necessary in order to avoid the formation of basic acetate. The crystals are finally dried on filtering paper, without heat :—

$$2HC_2H_3O_2 + PbO = Pb2C_2H_3O_2 + H_2O.$$

2. Nitrate of Lead.

Dissolve oxide of lead ($4\frac{1}{2}$ oz.) in dilute nitric acid (1 pint) by the aid of a gentle heat; filter and crystallise :—

$$PbO + 2HNO_3 = Pb(NO_3)_2 + H_2O.$$

Instead of oxide of lead, metallic lead, or the carbonate of lead, may be used.

From the **Nitrate of Lead** is prepared :—

Iodide of Lead.

Dissolve nitrate of lead (4 oz.), by the aid of a gentle heat, in distilled water ($\frac{1}{2}$ pint); dissolve iodide of potassium (4 oz.) in distilled water ($\frac{1}{2}$ pint); mix the solutions. Collect the precipitate of iodide of lead on a filter, and wash away the nitrate of potassium with distilled water; dry the precipitate at a gentle heat:—

$$Pb(NO_3)_2 + 2KI = PbI_2 + 2KNO_3.$$

From the **Acetate of Lead** is prepared:—

Subacetate of Lead (Solution of).

Boil acetate of lead (5 oz.) and oxide of lead (3½ oz.) in water for half an hour, constantly stirring. Filter, and keep the clear solution in stoppered bottles:—

$$Pb2C_2H_3O_2 + PbO = Pb_2O2C_2H_3O_2.$$

CHARACTERS AND TESTS.

Plumbi Acetas.

In white crystalline masses, slightly efflorescent, having an acetous odour and a sweet astringent taste. It may be obtained in large, flat, four-sided crystals. Is soluble in water and alcohol. Its aqueous solution slightly reddens litmus; gives a yellow precipitate of iodide of lead with iodide of potassium; a white precipitate of sulphate of lead with sulphuric acid, acetic acid being set free; and a black precipitate of sulphide of lead with sulphuretted hydrogen. Its solution in distilled water is clear, or has only a slight milkiness, which disappears on the addition of acetic acid. It is distinguished from solution of subacetate of lead by the latter forming an opaque white jelly with mucilage of gum arabic. 38 grains ($\frac{1}{10}$ of a molecule) dissolved in water require for complete precipitation 200 grain-measures ($\frac{1}{10}$ of a molecule) of the volumetric solution of oxalic acid.

Plumbi Carbonas.

Commonly called "white lead" (ceruse). Occurs as a soft, heavy white powder, blackened by sulphuretted hydrogen (PbS), insoluble in water; soluble, with effervescence, in diluted acetic acid, leaving no residue (absence of sulphates), and forming a solution which gives a yellow precipitate of iodide of lead with iodide of potassium, and a white precipitate of sulphate of lead with sulphuric acid. The acetic solution, when treated with excess of sulphuretted hydrogen, boiled and filtered, gives no precipitate with oxalate of ammonium, showing the absence of chalk or whiting.

Plumbi Iodidum.

A bright yellow powder, tasteless and odourless; sp. gr. 6·384. Is sparingly soluble in cold water, but is entirely soluble in boiling water, from which it is deposited, on cooling, in golden crystalline scales. It is soluble in alcohol, acetic acid, solution of potash, and solutions of the alkaline iodides. Fuses at a moderate heat, but is decomposed at a high temperature, violet vapours being evolved. If 100 grains be dissolved in nitric acid diluted with twice its weight of boiling water, and, after the iodine is expelled, sulphate of sodium be added, 66 grains of sulphate of lead are thrown down.

Plumbi Nitras.

In colourless octahedral crystals, which are nearly opaque, permanent in the air, of a sweetish astringent taste, soluble in water and alcohol. The aqueous solution gives a black precipitate of sulphide of lead with sulphuretted hydrogen, a white precipitate of sulphate of lead with sulphuric acid, and a yellow precipitate of iodide of lead with iodide of potassium. Added to a solution of sulphate of indigo it discharges its colour (characteristic of a nitrate).

Plumbi Oxidum.

In heavy scales of a pale brick-red colour, completely soluble without effervescence (absence of carbonic acid, which it slowly absorbs from the air) in diluted nitric and acetic acids, either solution, when neutral, giving a copious yellow precipitate of iodide of lead with iodide of potassium. Its solution in diluted nitric acid, when supersaturated with ammonia and then cleared by filtration, does not exhibit a blue colour, indicating the absence of copper. Oxide of lead decomposes the neutral fats, like the caustic alkalies, forming with them insoluble soaps. It is soluble in lime-water and in solutions of caustic potash and soda.

COMPOUNDS OF POTASSIUM. [K=39.]

Name.	B. P. Preps.	Strength.	Dose.	Action and Use.
Potassa Caustica Caustic Potash, or Hydrate of Potassium KHO	— Liquor Potassæ	— 27 grs. to 1 oz.	— 15 to 60 mins.	A powerful caustic; used for making issues. Liquor Potassæ is given internally as an antacid and stomachic sedative in dyspepsia. Acts as an alterative to the glandular system. Employed to diminish viscidity of secretion in chronic bronchitis. Also given in obesity, lithiasis, scrofula, syphilis, and in chronic rheumatism. Used as a stimulant and antipruritic local application in certain chronic skin diseases, and as an escharotic in poisoned wounds.
Potassa Sulphurata Sulphurated Potash, Hepar Sulphuris	— Unguentum Potassæ Sulphuratæ	— 1 pt. in 15½	3 to 6 grs. —	Stimulating diaphoretic and expectorant. Used in chronic skin diseases and in chronic rheumatism. Used externally also in the latter cases. Destroys fungi and parasites.
Potassii Acetas Acetate of Potassium $KC_2H_3O_2$	—	—	10 to 60 grs.	Diuretic and purgative. Given in dropsies; also in acute rheumatism, skin diseases, and chronic enlargement of glands. Acts as an antilithic.
	Solution of (App. II.)	1 in 10	—	Test for Tartaric Acid.
Potassii Bicarbonas Bicarbonate of Potassium $KHCO_3$	— Liquor Potassæ Effervescens	— 30 grs. in 1 pt.	10 to 40 grs. 5 to 10 ozs.	A direct antacid and alterative. Given in dyspepsia, in lithiasis, and in acute rheumatism, etc.

COMPOUNDS OF POTASSIUM. [K=39] (*continued*).

Name.	B. P. Preps.	Strength.	Dose.	Action and Use.
Potassii Bichromas Bichromate of Potassium K_2CrO_4,CrO_3	— Volumetric solution of (App. III.)	— —	— —	Used in the preparation of Valerianate of Sodium and Chromic Acid, and for the quantitative determination of the protoxide in preparations of iron.
Potassii Bromidum Bromide of Potassium KBr	—	—	5 to 30 grs.	Alterative, soporific. Given in sleeplessness, nervous affections, epilepsy, delirium tremens, convulsions, throat affections, etc.
Potassii Carbonas Carbonate of Potassium K_2CO_3	—	—	10 to 30 grs.	Almost the same action and uses as potash, but less caustic.
Potassii Chloras Chlorate of Potassium $KClO_3$	— Trochisci Potassii Chloratis	— 5 grs. in each	10 to 30 grs. 1 to 6	Refrigerant. Given in low fevers. Useful as a gargle in stomatitis, aphthous and other ulcerations of the gums, mouth, and throat; cancrum oris; ptyalism, etc.
Potassii Citras Citrate of Potassium $K_3C_6H_5O_7$	—	—	20 to 60 grs.	Diaphoretic, diuretic, and mild laxative. Used in uric acid gravel, etc. Acts as an alterative in some chronic affections. Antiscorbutic.
Potassii Cyanidum Cyanide of Potassium KCN	—	—	—	Used in the purification of Bismuth.
Potassii Ferrocyanidum Yellow Prussiate of Potash, Ferrocyanide of Potassium $K_4FeC_6N_6.3H_2O$	Solution of (App. II.)	—	—	Not used medicinally. Tests for persalts of iron. Used to prepare Acid. Hydrocyanicum Dil. and Cyanide of Potassium.
Potassii Ferricyanidum Red Prussiate of Potash, Ferricyanide of Potassium $K_6Fe_2C_{12}N_{12}$	Solution of (App. II.)	¼ oz. to 5 oz.	—	Test for protosalts of iron.

COMPOUNDS OF POTASSIUM. [K=39] (*continued*).

Name.	B. P. Preps.	Strength.	Dose.	Action and Use.
POTASSII IODIDUM Iodide of Potassium KI	—	—	2 to 20 grs.	Diuretic, alterative. Given internally in scrofula, glandular enlargements, and hypertrophies; in syphilis, dropsy, rheumatism, aneurism, lead-poisoning, etc. Externally used in syphilitic and glandular affections, in skin diseases, etc.
	Lin. Pot. Iodid. cum Sapone	54½ grs. to 1 oz.	—	
	Ung. Pot. Iodid.	1 pt. in 8¾	—	
	Solution of (App. II.)	1 pt. in 10	—	Test for lead.
POTASSII NITRAS Nitrate of Potassium KNO_3	—	—	10 to 30 grs.	Refrigerant, diaphoretic and diuretic. Used to allay irritation in dyspepsia. In large doses, a vascular sedative, and as such used in acute inflammations — *e.g.*, rheumatism, etc.
POTASSII PERMANGANAS Permanganate of Potassium $KMnO_4$	—	—	—	Disinfectant, antiseptic, deodoriser. Used as an application to foul ulcers, etc., and as an injection, gargle, etc. May be given internally to correct offensive evacuations and fœtid expectoration.
	Liquor Potassii Permanganatis	1 pt. in 100	2 to 4 drms.	
POTASSII SULPHAS Sulphate of Potassium K_2SO_4	—	—	15 to 60 grs.	Mild purgative, alterative. Represses secretion of milk. Enters into composition of Pil. Colocynth Co. and Pulv. Ipecac. Co.
POTASSII TARTRAS Tartrate of Potassium, or Soluble Tartar $K_2C_4H_4O_6$	—	—	60 grs. to ½ oz.	Diuretic. In large doses, a mild purgative.
POTASSII TARTRAS ACIDA Acid Tartrate of Potassium, Bitartrate of Potassium, or Cream of Tartar $KHC_4H_4O_6$	—	—	20 to 60 grs.	Refrigerant, diuretic. In large doses, a hydragogue purgative. Used in dropsies Used in preparation of Tartaric Acid; the officinal Tartrates; Conf. Sulphuris; and Pulv. Jalapæ Co.

PREPARATION.

From **Pearl-ash** (the product of the lixiviation of wood-ash) is prepared :—

Carbonate of Potassium.

Treat pearl-ash with its own weight of distilled water, and evaporate the solution so formed to dryness, while it is kept briskly agitated.

From **Carbonate of Potassium** are prepared :—

1. Acetate of Potassium.

To acetic acid (2 pints), placed in a thin porcelain basin, add gradually carbonate of potassium (20 oz.); filter, acidulate, if necessary, with a few additional drops of the acid, and, having evaporated to dryness, raise the heat cautiously so as to liquefy the product. Allow the basin to cool, and when the salt has solidified, and while it is still warm, break it into fragments and put it into stoppered bottles :—

$$K_2CO_3 + 2HC_2H_3O_2 = 2KC_2H_3O_2 + H_2O + CO_2.$$

In this process an acid reaction is given to the solution, so as to completely neutralise the potash; the presence of a very little carbonate producing, during the liquefaction of the salt, a brown discoloration.

2. Bicarbonate of Potassium.

Pass carbonic acid gas (generated from marble and hydrochloric acid) through a strong solution of carbonate of potassium for a week. Crystals of the less soluble bicarbonate of potassium are gradually deposited :—

$$K_2CO_3 + H_2O + CO_2 = 2KHCO_3.$$

The following are the details of the process :—

Dissolve carbonate of potassium (1 pound) in distilled water (2 pints), and filter the solution into a three-pint bottle, capable of being tightly closed by a cork traversed by a glass tube sufficiently long to pass to the bottom of the fluid. Introduce marble (1 pound) into another bottle, in the bottom of which a few small holes have been drilled, and the mouth of which is closed by a cork also traversed by a glass tube, and place the bottle in a jar of the same height as itself, but of rather larger diameter. Connect the two glass tubes air-tight by a caoutchouc tube. The cork of the bottle containing the carbonate of potassium having been placed loosely, and that of the bottle containing the marble tightly, in its mouth, pour into the jar surrounding the latter bottle hydrochloric acid (1½ pint) previously diluted with water (3 pints). When carbonic acid gas has passed through the potash solution for two minutes, so as to expel the whole of the air of the apparatus, fix the cork tightly in the neck of the bottle, and let the process go on for a week. At the end of this time numerous crystals of bicarbonate of potassium will have formed, which are to be removed, shaken with twice their bulk of cold distilled water, and, after decantation of the water, drained, and dried on filtering paper by exposure to the air. The mother liquid, filtered if necessary, and concentrated to one-half at a temperature not exceeding 110°, will yield more crystals. The tube immersed in the solution of carbonate of potassium, which should have as large a diameter as possible, may require the occasional removal of the crystals formed within it, in order that the process may not be interrupted.

3. Bichromate of Potassium.

Roast chrome iron ore (FeO,Cr_2O_3) with a mixture of carbonate of potassium, nitre, and chalk in a furnace through which a current of air passes. Yellow chromate of potassium is thus formed:—

$$2FeO,Cr_2O_3 + 4K_2CO_3 + O_7 = Fe_2O_3 + 4K_2CrO_4 + 4CO_2.$$

The object of adding the chalk is to keep the mixture in a porous state by diminishing its fusibility. The yellow chromate, when treated with sulphuric acid, yields the red bichromate of potassium:—

$$2K_2CrO_4 + H_2SO_4 = K_2Cr_2O_7 + K_2SO_4 + H_2O.$$

4. Chlorate of Potassium.

Pass chlorine gas (generated from black oxide of manganese and hydrochloric acid) over a mixture of carbonate of potassium and excess of slaked lime; chlorate of potassium, chloride of calcium, and carbonate of lime are thus formed; the latter is removed by filtration, and the chlorate of potassium crystallises on evaporation:—

$$K_2CO_3 + 6CaH_2O_2 + 6Cl_2 = 2KClO_3 + 5CaCl_2 + CaCO_3 + 6H_2O.$$

The following are the details:—

Mix slaked lime (53 oz.) with carbonate of potassium (20 oz.) and triturate them with a few ounces of water so as to make the mixture slightly moist. Place oxide of manganese (80 oz.) in a large retort or flask, and having poured upon it hydrochloric acid (24 pints) diluted with water (6 pints); apply a gentle sand heat, and conduct the chlorine as it comes over, first through a bottle containing six ounces of water, and then into a large carboy containing the mixture of carbonate of potassium and slaked lime. When the whole of the chlorine has come over, remove the contents of the carboy, and boil them for twenty minutes with water (7 pints); filter and evaporate till a film forms on the surface, and set aside to cool and crystallise. The crystals thus obtained are to be purified by dissolving them in three times their weight of boiling distilled water, and again allowing the solution to crystallise.

5. Citrate of Potassium.

Dissolve crystals of citric acid (6 oz.) in distilled water (2 pints), add carbonate of potassium (8 oz.) gradually, and, if the solution be not neutral, make it so by the cautious addition of the acid or the carbonate of potassium. Then filter, and evaporate to dryness, stirring constantly after a pellicle has begun to form, till the salt granulates. Triturate in a dry warm mortar, and preserve in stoppered bottles :—

$$3K_2CO_3 + 2H_3C_6H_5O_7 = 2K_3C_6H_5O_7 + 3H_2O + 3CO_2.$$

6. **Ferrocyanide of Potassium.**

Fuse animal substances, such as the cuttings of horns, hoofs, and skins, with carbonate of potassium, in an iron pot; lixiviate the crude product in water, and purify the salt by crystallisation :—

$$6KCN + Fe + 2H_2O = K_4FeCy_6 + 2KHO + H_2.$$

7. **Sulphurated Potash.**

Mix carbonate of potassium (10 oz.) and sublimed sulphur (5 oz.) in a warm mortar, and having introduced them into a crucible, let this be heated, first gradually until effervescence has ceased, and finally to dull redness, so as to produce perfect fusion. Let the liquid contents of the crucible be then poured out on a clean flag-stone, and covered quickly with an inverted porcelain basin, so as to exclude the air as completely as possible while solidification is taking place. The solid product thus obtained should, when cold, be broken into fragments, and immediately enclosed in a green-glass bottle, furnished with an air-tight stopper. In this process hyposulphite and sulphide of potassium are formed :—

$$3K_2CO_3 + 4S_2 = K_2S_2O_3 + 2K_2S_3 + 3CO_2.$$

Too high a heat would decompose the hyposulphite into sulphate and sulphite.

8. **Tartrate of Potassium.**

Dissolve carbonate of potassium (9 oz.) in boiling distilled water (2½ pints); add by degrees acid tartrate of potassium

(20 oz.), and if, after a few minutes' boiling, the liquid is not neutral to test-paper, make it so by the careful addition of more of the carbonate or of the acid tartrate. Then filter, concentrate till a pellicle forms on the surface, and set it aside to cool and crystallise. More crystals may be obtained by evaporating and cooling the mother liquor. Drain the crystals, dry them by exposure to the air in a warm place, and preserve them in a stoppered bottle:—

$$2KHC_4H_4O_6 + K_2CO_3 = 2K_2C_4H_4O_6 + CO_2 + H_2O.$$

9. **Caustic Potash.**

Boil down solution of potash (made by the action of slaked lime on the carbonate) rapidly in a silver or clean iron vessel, until there remains a fluid of oily consistence, a drop of which, when removed on a warm glass rod, solidifies on cooling. Pour it now into proper moulds, and when it has solidified, and while it is still warm, put it into stoppered bottles. Neither platinum, glass, nor porcelain vessels can be used in this process, as caustic potash acts injuriously on those materials.

From **Caustic Potash** are prepared:—

1. **Bromide of Potassium.**

Put solution of potash (2 pints) into a glass or porcelain vessel, and add bromine (4 oz.) in successive portions, with constant agitation, until the mixture has acquired a permanent brown tint. By this means, bromide and bromate of potash are formed:—

$$6KHO + Br_6 = 5KBr + KBrO_3 + 3H_2O.$$

Evaporate to dryness; reduce the residue to a fine powder, and mix this intimately with powdered wood charcoal (2 oz.). Throw the mixture, in small quantities at a time, into a red-hot iron crucible, and when the whole has been brought to a state of fusion, remove the crucible from the fire, and pour out its contents. By this means the bromate of potassium is converted into bromide :—

$$KBrO_3 + C_3 = KBr + 3CO.$$

When the fused mass has cooled, dissolve it in the water, filter the solution through paper, and set it aside to crystallise. Drain the crystals, and dry them with a gentle heat. More crystals may be obtained by evaporating the mother liquid, and cooling. The salt should be kept in a stoppered bottle.

2. Iodide of Potassium.

Is obtained by a process analogous to that directed for the preparation of the bromide, the substances used being solution of potash (1 gallon), iodine (29 oz.), and wood charcoal (3 oz.). The reactions expressing the decompositions are :—

1. $6KHO + I_6 = 5KI + KIO_3 + 3H_2O.$
2. $KIO_3 + C_3 = KI + 3CO.$

From **Caustic Potash** and **Chlorate of Potassium** is prepared :—

Permanganate of Potassium.

Reduce chlorate of potassium ($3\frac{1}{2}$ oz.) to fine powder, and mix it with oxide of manganese (4 oz.); put the mixture into a porcelain basin, and add to it caustic potash (5 oz.), previously dissolved in four ounces of water. Evaporate to dryness on a sand bath, stirring diligently to prevent spurting. Pulverise the mass, put it into a covered Hessian or Cornish crucible, and expose it to a dull red heat for an hour, or till it has assumed the condition of a semifused mass. In this stage of the process manganate of potassium is formed :—

$$6KHO + 3MnO_2 + KClO_3 = 3K_2MnO_4 + KCl + 3H_2O.$$

Let the mass cool, pulverise it, and boil with a pint and a half of the water. Let the insoluble matter subside, decant the fluid, boil again with half a pint of the water, again decant, neutralise the united liquors accurately with dilute sulphuric acid, and evaporate till a pellicle forms. By this means the green manganate is converted into the purple permanganate :—

$$3K_2MnO_4 + 2H_2O = 2KMnO_4 + 4KHO + MnO_2.$$

Set aside to cool and crystallise. Drain the crystalline mass, boil it in six ounces of the water, and strain through a funnel the throat of which is lightly obstructed by a little asbestos. Let the fluid cool and crystallise, drain the crystals, and dry them by placing them under a bell jar over a vessel containing sulphuric acid. Asbestos is used as the filtering material, as organic matter would decompose the permanganate.

From **Ferrocyanide of Potassium** are prepared :—

1. **Cyanide of Potassium.**

May be obtained by heating ferrocyanide of potassium at a red-heat until gas ceases to be evolved, allowing the sediment to subside in the still molten mass and pouring off the clear fluid. It may be purified, if necessary, by solution in and crystallisation from spirit :—

$$K_4FeC_6N_6 = 4KCN + FeC_2 + N_2.$$

2. **Ferricyanide of Potassium.**

Pass chlorine gas through a solution of yellow prussiate of potash, until it ceases to give a blue precipitate with a persalt of iron :—

$$2K_4FeCy_6 + Cl_2 = K_6Fe_2Cy_2 + 2KCl.$$

From **Argol** (the deposit on inside of wine casks) is prepared :—

Bitartrate of Potassium.

During the fermentation of the grape-juice alcohol is formed, and the *argol*, or *red* or *crude tartar* (which consists of acid tartrate, tartrate of lime, and colouring matter), being insoluble in the alcohol, is deposited as a crust on the inside of the casks. It is purified from the lime salt and the colouring matter by charcoal and clay, and by re-crystallisation.

From **Nitre-soils** is obtained :—

Nitrate of Potassium.

Certain Indian soils contain nitrate of potassium united with nitrate of lime. On treating these with wood-ashes or carbonate of potassium, an insoluble carbonate of calcium is formed, and is separated from the soluble nitrate of potassium by solution of the latter. The nitrate of potassium is finally crystallised, and may be purified by re-solution and re-crystallisation.

From **Nitrate of Potassium** is prepared :—

Sulphate of Potassium.

The residuum of the distillation of nitric acid, when made by the action of sulphuric acid on nitre, consists of acid sulphate of potassium ($KHSO_4$). From this the neutral sulphate is prepared by dissolving it in water, and neutralising it with carbonate of potassium :—

$$2KHSO_4 + K_2CO_3 = 2K_2SO_4 + H_2O + CO_2.$$

The salt is crystallised from the neutral solution.

CHARACTERS AND TESTS.

Potassa Caustica.

In hard white pencils. Sp. gr. 2·2. Very deliquescent, powerfully alkaline and corrosive; is readily soluble in water and in alcohol. Its aqueous solution decomposes most metallic salts, precipitating from solution all metals which form insoluble oxides or hydrates. The precipitates it forms in solution of aluminium, glucinum, chromium, zinc, and lead, are soluble in excess of the alkali, but all others are insoluble; on account of its solvent action on oxide of lead, it should not be kept in white glass bottles. It precipitates from vegetable infusions their alkaloids or neutral principles. It melts below redness, forming an oily fluid, which decomposes even silicates. A watery solution acidulated with nitric acid gives a yellow precipitate with perchloride of platinum—the double chloride of potassium and platinum ($2KCl, PtCl_4$), the general test for potassium—and scanty white precipitates with nitrate of silver and chloride of barium, showing the presence of traces of chlorides and of sulphates. Fifty-six grains (1 molecule) dissolved in water leave only a trace of sediment, and require for neutralisation at least 900 grain-measures of the volumetric solution of oxalic acid.

Potassa Sulphurata.

Solid greenish fragments, liver-brown when recently broken; rapidly absorbs oxygen from the air, and becomes dull-white, sulphate of potassium being formed; is alkaline, acrid to the taste; forms readily with water a yellow solution, which has the odour of sulphuretted hydrogen, and evolves it freely when excess of hydrochloric acid is dropped into it, sulphur being at the same time deposited:—

$$K_2S_3 + 2HCl = 2KCl + H_2S + S_2.$$

It strikes black with salts of lead. The acid fluid when boiled and filtered is precipitated yellow by perchloride of platinum, proving presence of a salt of potash; and white by chloride of barium, proving presence of sulphuric acid. About three-fourths of its weight (the sulphide of potassium) are dissolved by rectified spirit. The sulphate of potassium, into which it becomes charged by oxidation, is insoluble in spirit.

Potassii Acetas.

White foliaceous satiny masses, very deliquescent. With its aqueous solution tartaric acid gives a crystalline precipitate of acid tartrate of potassium. Sulphuric acid causes the disengagement of acetic acid, and a dilute solution of perchloride of iron strikes a blood-red colour with the solution, owing to the formation of peracetate of iron. It is entirely soluble in rectified spirit, showing the absence of carbonate and other salts of potassium. It is neutral to test-paper, showing the absence of cream of tartar, which if present would give it an acid reaction; and its solution is unaffected by sulphide of ammonium, proving the absence of metallic impurities.

Potassii Bicarbonas.

Colourless right rhombic prisms, not deliquescent, of a saline feebly alkaline taste, not corrosive. Insoluble in alcohol, soluble in four parts of cold water and in one part of boiling water; its aqueous solution does not affect turmeric paper. Dilute hydrochloric acid cause strong effervescence (CO_2), forming a solution with which perchloride of platinum gives the yellow precipitate characteristic of potash salts. From the carbonate it is distinguished by a solution of corrosive sublimate, which gives a brick-red precipitate with the former, and a very slight white precipitate with the bicarbonate; this test fails with the carbonate if chloride of sodium be present. The bicarbonate does not give a precipitate with sulphate of magnesium until the mixture is boiled. Fifty grains exposed to a low red-heat leave $34\frac{1}{2}$ grains of a white residue of carbonate of potassium, which require for exact saturation 500 grain-measures of the volumetric solution of oxalic acid. Twenty grains of it neutralise 14 grains of citric or 15 grains of tartaric acid.

Potassii Bichromas.

In large red, transparent, four-sided tables; anhydrous; fuses below redness; at a higher temperature is decomposed, yielding green oxide of chromium and yellow chromate of potash, which may be separated by dissolving the latter in water. On adding excess of oil of vitriol to a cold saturated solution of bichromate of potassium, chromic anhydride is deposited in crimson needles ($K_2CrO_4,CrO_3+H_2SO_4=2CrO_3+K_2SO_4+H_2O$). Dissolved in water, bichromate of potassium gives with chloride of barium a yellowish-white precipitate ($BaCrO_4$), and with nitrate of silver it gives a purplish-red precipitate ($Ag_2CrO_4CrO_3$). Both these precipitates are soluble in diluted nitric acid. The solution also, when digested with sulphuric acid and rectified spirit, acquires an emerald-green colour of chromic sulphate (Cr_23SO_4), the liberated oxygen converting the alcohol into aldehyd.

Potassii Bromidum.

In colourless cubical crystals; with no odour, but a pungent saline taste, readily soluble in water, less soluble in spirit. Its aqueous solution gives a white crystalline precipitate of acid tartrate of potassium with tartaric acid. When its solution in water is mixed with a little chlorine, chloroform agitated with it, on falling to the bottom, exhibits a red colour. In this test the chlorine sets free bromine, which is dissolved by the chloroform and colours it. Ten grains require for complete decomposition about 840 grain-measures of the volumetric solution of nitrate of silver. If more than 850 grain-measures be required, the presence of a chloride is indicated, the equivalent of chlorine being less than half that of bromine; if less than 838 be required, the presence of an iodide is indicated, the equivalent of iodine being nearly double that of bromine. A solution of the salt mixed with mucilage of starch and a drop of an aqueous solution of bromine or chlorine does not exhibit any blue colour, showing the absence of iodine.

Potassii Carbonas.

A white crystalline powder, alkaline and caustic to the taste, very deliquescent, and thus differing from the bicarbonate and from the carbonates of sodium; it is readily soluble in water, but insoluble in spirit, showing the absence of hydrate of potassium. Effervesces with dilute hydrochloric acid, and forms a solution which gives a yellow precipitate with perchloride of platinum. Loses about sixteen per cent. of its weight (water of crystallisation) when exposed to a red heat. When supersaturated with nitric acid, and evaporated to dryness, the residue is almost entirely soluble in water, only a little silica remaining undissolved; and the solution is precipitated only faintly by chloride of barium and nitrate of silver, indicating the presence of traces of sulphates and chlorides. Unlike the bicarbonate, carbonate of potassium gives a white precipitate with sulphate of magnesium. Eighty-three grains require for neutralisation at least 980 grain-measures of the volumetric solution of oxalic acid. Twenty grains of it will neutralise 17 grains of citric or 18 grains of tartaric acid.

Potassii Chloras.

In colourless rhomboidal crystalline plates, with a cool saline taste, sparingly soluble in cold water. It explodes when triturated with sulphur. When a few drops of sulphuric acid are dropped on the crystals, they become orange-red, and give off yellow vapours of peroxide of chlorine. An explosive gas, *euchlorine*, is formed when chlorate of potassium is gently heated with hydrochloric acid. Solution of chlorate of potassium should not give a precipitate with nitrate of silver or oxalate of ammonium, proving the absence of chlorides and of calcium. By heat the salt fuses, gives off oxygen gas, and leaves a white residue of chloride of potassium, which forms with water a neutral solution, which is precipitated white by nitrate of silver ($AgCl$), and yellow by perchloride of platinum ($2KCl,PtCl_4$).

Potassii Citras.

A white powder of saline feebly-acid taste, deliquescent, and very soluble in water. Heated with sulphuric acid, it forms a brown fluid, gives off an inflammable gas (carburetted hydrogen, CH_4), and evolves the odour of acetic acid. Its solution, mixed with a solution of chloride of calcium, remains clear till it is boiled, when a white precipitate of citrate of calcium separates, which is readily soluble in acetic acid. This test proves the absence of tartrate, with which chloride of calcium gives an immediate precipitate in the cold. Solution of citrate of potassium, acidulated with hydrochloric acid, gives a yellow precipitate with perchloride of platinum; 102 grains of it ($\frac{1}{3}$ of a molecule of the salt containing 1 molecule of potash, the acid being tribasic) heated to redness till gases cease to be evolved, leave an alkaline residue of carbonate of potassium mixed with carbon, which requires for exact neutralisation 1,000 grain-measures of the volumetric solution of oxalic acid.

Potassii Cyanidum.

In white opaque deliquescent crystalline masses, having the odour of hydrocyanic acid. It is readily soluble in water, but sparingly in absolute alcohol. The aqueous solution has an alkaline reaction; it yields no precipitate with ferrocyanide of potassium. The alcoholic solution gives no precipitate with chloride of barium. Ten grains dissolved in an ounce of distilled water require about 730 grain-measures of volumetric solution of nitrate of silver to be added before a permanent precipitate begins to form, corresponding to about 95 per cent. of real cyanide of potassium.

Potassii Iodidum.

In colourless, generally opaque, cubic crystals, of a bitterish and acrid saline taste, not deliquescent in dry air; readily soluble in water, less so in alcohol. It usually has a feeble alkaline reaction. Its solution mixed with mucilage of starch gives a blue colour on the addition of a little solution of chlorine. It gives a crystalline precipitate of acid tartrate of potassium with tartaric acid. The addition of tartaric acid and mucilage of starch to its aqueous solution should not develop a blue colour, showing the absence of iodate of potassium. Were iodate present, the acid would liberate iodic acid from it, and hydriodic acid from the iodide; these acids, reacting on each other, set free iodine, which would then colour the starch ($HIO_3 + 5HI = 3H_2O + I_6$). With solution of nitrate of silver it gives a pale yellow precipitate of iodide of silver, which is insoluble in solution of ammonia; the addition to the ammoniacal liquid of nitric acid in excess should not cause turbidity, showing the absence of chlorides, chloride of silver being soluble in ammonia. With saccharated solution of lime, the solution of iodide of potassium would give a precipitate, were carbonates present. Iodide of potassium is a solvent of iodine and insoluble iodides.

Potassii Nitras.

In white crystalline masses or fragments of striated six-sided prisms, colourless, of a peculiar cool saline taste. Readily soluble in water, sparingly in rectified spirit. Sp. gr. 2·07. Thrown on the fire it deflagrates; heated to redness, it loses oxygen, and is converted into deliquescent nitrite. Warmed in a test-tube with sulphuric acid and copper-wire, it evolves ruddy fumes of NO_2, showing the presence of nitric acid. Its solution, acidulated with hydrochloric acid, gives the yellow precipitate with perchloride of platinum. Its solution is not affected by chloride of barium nor nitrate of silver, showing the absence of sulphates or chlorides.

Nitre is a powerful oxidising agent. When fused and cast into moulds it forms little bullet-shaped masses, and is known as *sal prunella*.

Potassii Permanganas.

Dark purple slender prismatic crystals, inodorous, with a sweet astringent taste, soluble in water. A single small crystal suffices to form with an ounce of water a rich purple solution, which, when mixed with a little rectified spirit and heated, becomes yellowish-brown; this is due to the reduction of the permanganic acid to hydrated peroxide, the alcohol being oxidised to acetic acid, which combines with the liberated potash. The crystals, heated to redness, decrepitate, evolve oxygen gas, and leave a black residue, from which water extracts potash, recognised by its alkaline reaction, and by its giving, when acidulated with hydrochloric acid, the characteristic yellow precipitate with perchloride of platinum. Entirely soluble in cold water. Five grains dissolved in water require for complete decoloration a solution of 44 grains of granulated sulphate of iron, acidulated with 2 fluid drachms of diluted sulphuric acid. In this reaction the oxidising power of the permanganate changes the iron from the ferrous to the ferric state, and manganic and potassium sulphates are formed.

Potassii Ferrocyanidum.

In large yellow crystals, permanent in the air, soluble in water, insoluble in alcohol. The aqueous solution precipitates deep blue with persulphate of iron, rich-brown with sulphate of copper, and white with acetate of lead. Heated with diluted sulphuric acid, hydrocyanic vapours are evolved. Used as a test for persalts of iron, with which it gives a blue precipitate; with protosalts of iron it gives a white precipitate.

Potassii Ferricyanidum.

Crystallises in garnet-red crystals, which are soluble in water, forming a green solution. Used as a test for protosalts of iron, with which it gives a deep-blue precipitate, 'Turnbull's blue;" with persalts of iron it gives no precipitate.

Potassii Sulphas.

In colourless hard six-sided prisms terminated by six-sided pyramids; these undergo no change on exposure to air, are sparingly soluble in water, insoluble in alcohol, have a bitterish and saline taste, and decrepitate strongly when heated. The aqueous solution should be neutral to test paper, showing freedom from the acid sulphate of potassium, and it should not be affected by oxalate of ammonium, showing absence of lime. When acidulated with hydrochloric acid, it is precipitated white by chloride of barium and yellow by perchloride of platinum.

Potassii Tartras.

In small colourless four or six-sided prisms. Taste, mildly saline and bitterish. Heated with sulphuric acid it forms a black tarry fluid, evolving inflammable gas and the odour of burned sugar. Acetic acid added sparingly to its solution causes the separation of a white crystalline precipitate of acid tartrate. Entirely dissolved by its own weight of water, hence sometimes called "soluble tartar." One hundred and twenty-two grains heated to redness till gases cease to be evolved, leave an alkaline residue, which requires for exact neutralisation 990 grain-measures of the volumetric solution of oxalic acid. Tartrate of potassium will be rendered slightly deliquescent if it contain carbonate of potassium; and it will have an acid reaction if adulterated with cream of tartar.

Potassii Tartras Acida.

A gritty white powder, or fragments of cakes crystallised on one surface; of a pleasant acid taste, sparingly soluble in water, insoluble in spirit. Heated in a crucible it evolves inflammable gas and the odour of burned sugar, and leaves a black residue (black-flux). This effervesces with diluted hydrochloric acid, and forms a solution which, when filtered, gives a yellow precipitate with perchloride of platinum, and when neutralised by ammonia is rendered slightly turbid by oxalic acid, indicating presence of a trace of lime. Two hundred and four grains heated to redness till gas ceases to be evolved leave an alkaline residue, which requires for neutralisation at least 1,000 grain-measures of the volumetric solution of oxalic acid.

COMPOUNDS OF SODIUM. [Na = 23.]

Name.	B. P. Preps.	Strength.	Dose.	Action and Use.
SODA CAUSTICA Caustic Soda, Hydrate of Soda $NaHO$	— Liq. Sodæ Volumetric Solution of Soda (App. III.)	— 18·8 grs. in 1 oz. 40 grs. in 1,000 grs.	— — —	Action same as caustic potash (p. 100), but it is less powerful and less deliquescent. Used in estimating the acids volumetrically.
SODA TARTARATA Tartarated Soda, Potassio-tartrate of Sodium, or Rochelle Salts $NaKC_4H_4O_6.4H_2O$	—	—	¼ to ½ oz.	In large doses, mild saline purgative; in small doses, diuretic. Given in same cases as tartrate of potassium.
SODII ARSENIAS Arseniate of Sodium $Na_2HAsO_4.7H_2O$	— Liq. Sodii Arseniatis	— ½ gr. in 1 oz.	$\frac{1}{16}$ to ⅛ gr. 5 to 10 mins.	Same action and use as Arsenious Acid; but is less liable to produce irritation of mucous membranes.
SODÆ BIBORAS Biborate of Soda, Borax $Na_2B_4O_7.10H_2O$	— Glycerinum Boracis Mel Boracis	— 1 pt. in 8 46 grs. in 1 oz.	5 to 40 grs. — —	Diuretic, antacid, emmenagogue. Used as a topical sedative to ulcerations of mucous membranes, and as a detergent. Is astringent and antipruritic.
SODII BICARBONAS Bicarbonate of Sodium $NaHCO_3$	— Liq. Sodæ Efferv. Sodæ Citro-Tart. Efferv. Trochisci Sodii Bicarbonatis	— 30 grs. in 1 pt. 17 pts. in 31 5 grs. in each	10 to 60 grs. — 60 grs. to ¼ oz. 1 to 6	Similar to bicarbonate of potassium, but not so efficacious in uric acid diathesis, and it influences the liver-secretion more.

COMPOUNDS OF SODIUM. [Na=23] (*continued*).

Name.	B. P. Preps.	Strength.	Dose.	Action and Use.
Sodii Bromidum Bromide of Sodium NaBr	—	—	10 to 30 grs.	Sedative and anaphrodisiac; as a whole its action is very similar to that of bromide of potassium, but is less depressing.
Sodii Carbonas Carbonate of Sodium $NaCO_3.10H_2O$	— Sodii Carbonas Exsiccata	— —	5 to 30 grs. 3 to 10 grs.	Similar to carbonate of potassium, but is less caustic.
Sodii Chloridum Chloride of Sodium, Common Salt NaCl	—	—	—	A necessary article of food. In large doses, emetic and purgative. Used in preparation of Hydrochloric Acid, Calomel, and Corrosive Sublimate.
Sodii Hypophosphis Hypophosphite of Sodium $NaPH_2O_2$	—	—	5 to 10 grs.	Similar to Calcis Hypophosphis (p. 59).
Sodii Hyposulphis Hyposulphite of Sodium $Na_2H_2S_2O_4.4H_2O$	Volumetric Solution of (App. III.)	24·8 grs. in 1,000	—	Used for estimation of Chlorine and Iodine.
Sodii Iodidum Iodide of Sodium NaI	—	—	3 to 10 grs.	Used for the same purposes as Iodide of Potassium, but is less depressing.
Sodii Nitras Nitrate of Sodium $NaNO_3$	—	—	—	Not used medicinally. Employed in preparation of Sodii Arsenias.
Sodii Phosphas Phosphate of Sodium $Na_2HPO_4.12H_2O$	—	—	$\frac{1}{4}$ to 1 oz.	In large doses, a mild saline purgative, and as such given in constipation of children. In small doses, diuretic, and used in uric acid diathesis. Used in preparation of Ferri Phosphas.
	Solution of (App. II.)	1 to 10	—	Test for Magnesia.
Sodii Salicylas Salicylate of Sodium $2NaC_7H_5O_3,H_2O$	—	—	10 to 30 grs.	Antipyretic, antiseptic, and antiferment. Internally it is given in acute rheumatism and in acute disorders where desired to reduce the temperature. Has a depressing action on the heart.

COMPOUNDS OF SODIUM. [Na=23] (*continued*).

Name.	B. P. Preps.	Strength.	Dose.	Action and Use.
SODII SULPHAS Sulphate of Sodium, Glauber's Salt $Na_2SO_4.10H_2O$	—	—	¼ to 1 oz.	Mild saline purgative, influencing the biliary secretion. In small doses, diuretic.
SODII SULPHIS Sulphite of Sodium $Na_2SO_3,7H_2O$	—	—	10 to 60 grs.	Antiseptic. Has been used with good effect for chronic vomiting accompanied by the presence of sarcinæ.
SODII SULPHOCARBOLAS Sulphocarbolate of Sodium $NaC_6H_5SO_4,2H_2O$	—	—	10 to 15 grs.	Antiseptic. Is used in the treatment of zymotic diseases, and as an application to inflamed mucous membranes.
SODÆ VALERIANAS Valerianate of Soda $NaC_5H_9O_2$	—	—	1 to 5 grs.	Resembles Valerian, acting as a powerful stimulant and antispasmodic. Used in preparation of Zinci Valerianas.

PREPARATION.

Sodium.

This metal is prepared by heating carbonate of sodium with carbon in an iron retort, the product, which distills over, being kept in naphtha.

Caustic Soda.

Boil down solution of soda in the manner directed for the preparation of caustic potash (p. 107).

Tartarated Soda.

Dissolve carbonate of sodium (12 oz.) in boiling distilled water, add gradually acid tartrate of potassium (16 oz.), and, if after being boiled for a few minutes the liquid has an acid or alkaline reaction, add a little carbonate of sodium or acid tartrate of potassium till a neutral solution is obtained. Boil and filter; concentrate the liquor till a pellicle forms on the surface, and set it aside to crystallise. More crystals may be obtained by again evaporating as before :—

$$2KHC_4H_4O_6 + Na_2CO_3 = 2KNaC_4H_4O_6 + H_2O + CO_2.$$

Arseniate of Sodium.

Reduce separately dry arsenious acid (10 oz.), dry nitrate of sodium ($8\frac{1}{2}$ oz.), and dried carbonate of sodium ($5\frac{1}{2}$ oz.) to fine powder, and mix them thoroughly in a porcelain mortar. Put the mixture into a large clay crucible, and cover it with the lid. Expose to a full red heat till all effervescence has ceased, and complete fusion has taken place. Pour out the fused salt on a clean flag-stone, and as soon as it has solidified, and while it is still warm, put it into boiling water (35 oz.), stirring diligently. When the salt has dissolved, filter the solution through paper, and set it aside to crystallise. Drain the crystals, and, having dried them rapidly on filtering paper, enclose them in stoppered bottles. In this process the nitrate of sodium yields oxygen to the arsenious acid, and converts it into arsenic acid, which expels the carbonic acid of the carbonate, and unites with all the soda present, forming pyro-arseniate of sodium :—$As_2O_3 + Na_2CO_3 + 2NaNO_3 = Na_4As_2O_7 + CO_2 + N_2O_3$. Solution in water converts the pyro-arseniate into the officinal salt :—

$$Na_4As_2O_7 + H_2O = 2Na_2HAsO_4.$$

Biborate of Soda (Borax).

Is produced by spontaneous evaporation on the shores of some lakes in Thibet, and is imported into this country under the names of "Tincal" and "Crude Borax." It is also obtained by saturating the boracic acid of Tuscany with carbonate of sodium.

Bicarbonate of Sodium.

Carbonic acid is slowly disengaged by means of the apparatus used in the preparation of bicarbonate of potassium and passed similarly under pressure into a mixture of carbonate of sodium (2 pounds) and dried carbonate of sodium (3 pounds). When the damp powder has ceased to absorb carbonic acid, it is shaken for half an hour with half its weight of water; the undissolved portion is then drained and dried by exposure to the air on filtering paper placed on porous bricks:—$Na_2CO_3 + H_2O + CO_2 = 2NaHCO_3$. When the crystallised carbonate alone is used, the CO_2 disengages enough water from it to dissolve the bicarbonate, and lead to its crystallisation on the apparatus; a due proportion of dried carbonate is therefore mixed with it to prevent this. The powder is finally washed with a little water, in order to remove any undecomposed carbonate.

Bromide of Sodium.

This salt may be obtained by the process described in connection with bromide of potassium, solution of soda being used in place of solution of potash, and crystallisation being conducted from warm solutions.

Carbonate of Sodium.

Formerly obtained from "Kelp" or "Barilla," the ashes obtained from burning sea-weeds. It is now obtained from chloride of sodium. This is first converted into sulphate of sodium by the action of sulphuric acid:—$2NaCl + H_2SO_4 = Na_2SO_4 + 2HCl$. The sulphate of sodium is then mixed with charcoal and chalk, and heated in a reverberatory furnace. The carbon thus reduces the sulphate to sulphide of sodium:—$Na_2SO_4 + 2C_2 = Na_2S + 4CO$. The sulphide now reacts on the chalk, forming an insoluble oxy-sulphide of calcium and carbonate of sodium:—

$$5Na_2S + 7CaCO_3 = 5Na_2 + CO_35CaS,2CaO + 2CO_2.$$

The crude carbonate thus formed is now dissolved out by water, and heated with sawdust, which, by the carbonic acid formed in its combustion, converts into carbonate any caustic soda that may have been produced by the action of quicklime on the sodic carbonate.

Native carbonate of sodium is obtained as an efflorescence from the borders of large lakes near Tripoli.

Dried carbonate of sodium is obtained by driving off the water of crystallisation from the carbonate by a strong heat.

Effervescent Citro-tartrate of Sodium.

Mix thoroughly powdered bicarbonate of sodium (17 oz.), powdered tartaric acid (8 oz.), and powdered citric acid (6 oz.); place them in a dish or pan of suitable form heated to between 200° and 220°, and when the particles of the powder begin to aggregate, stir them assiduously until they assume a granular form; then, by means of suitable sieves, separate the granules of uniform and most convenient size, and preserve the preparation in well-closed bottles. In this process the particles of the powder are merely agglutinated by the water of crystallisation, without mutual decomposition, which is only effected by solution in water.

Hypophosphite of Sodium.

Add carbonate of sodium to solution of hypophosphite of calcium as long as a precipitate of carbonate of calcium is formed:—

$$Ca2PH_2O_2 + Na_2CO_3 = 2NaPH_2O_2 + CaCO_3.$$

The carbonate of calcium is then removed by filtration, the solution evaporated to dryness, and the salt solidifies.

Hyposulphite of Sodium.

Gently warm a solution of sulphite of sodium with finely powdered sulphur:—

$$Na_2S_2O_3 + S + H_2O = Na_2H_2S_2O_4.$$

Iodide of Sodium.

This salt may be obtained by the process described in connection with iodide of potassium, solution of soda being used in place of potash.

Nitrate of Sodium.

Found native in Peru, Chili, and other parts of South America. Sometimes termed Peruvian or Chilian nitre. It is purified by crystallisation from water.

Phosphate of Sodium.

Place bone-ash, which is mainly Ca_32PO_4 (10 pounds), in a capacious earthenware or leaden vessel, pour on sulphuric acid (56 oz.), and stir with a glass rod until the whole powder is thoroughly moistened. Acid phosphate of calcium and calcic sulphate are thus formed; the former remains in solution and the latter is for the most part precipitated:—

$$Ca_32PO_4 + 2H_2SO_4 = CaH_42PO_4 + 2CaSO_4.$$

After twenty-four hours, add gradually, with constant stirring, distilled water (1 gallon); digest for forty-eight hours, adding distilled water from time to time to replace what has evaporated. Add now again distilled water (1 gallon), stirring diligently; digest for an hour, filter through calico, and wash what remains on the filter (calcic sulphate) with successive portions of distilled water, till it has almost ceased to have an acid reaction. Concentrate the filtrate (acid phosphate of calcium) to a gallon; let it rest for twenty-four hours, and filter again. Heat the filtrate to near the boiling point, and add carbonate of sodium (16 pounds) previously dissolved in distilled water (2 gallons) till it ceases to form a precipitate and the fluid has acquired a feeble alkaline reaction. In this part of the process dibasic phosphate of lime is precipitated, and dibasic phosphate of sodium is formed and remains in solution:—

$$CaH_42PO_4 + Na_2CO_3 = Na_2HPO_4 + CaHPO_4 + H_2O + CO_2.$$

Filter through calico, evaporate the clear liquor till a film forms on the surface, and set it aside to crystallise. More crystals will be obtained by evaporating the mother-liquor, a little carbonate of sodium being added if necessary to maintain its alkalinity. Dry the crystals rapidly, and without heat, on filtering paper placed on porous bricks, and preserve them in stoppered bottles.

Salicylate of Sodium.

Is prepared by the action of salicylic acid on carbonate of sodium or caustic soda.

Sulphate of Sodium.

Is obtained in the manufacture of hydrochloric acid from common salt and sulphuric acid :—$NaCl + H_2SO_4 = NaHSO_4 + HCl$. The acid sulphate of sodium thus formed is then neutralised with carbonate of sodium, and the resulting neutral sulphate crystallised out :—

$$2NaHSO_4 + Na_2CO_3 = 2Na_2SO_4 + H_2O + CO_2.$$

Sulphite of Sodium.

May be obtained by saturating a solution of carbonate of sodium with sulphurous acid and crystallising.

Sulphocarbolate of Sodium.

Is formed by dissolving pure carbolic acid in excess of sulphuric acid. The sulphocarbolic acid so formed is supersaturated with carbonate of barium to precipitate any free sulphuric acid. The filtrate is then treated with carbonate of sodium, and crystals of sulphocarbolate of sodium are yielded on evaporation.

Valerianate of Sodium.

Dilute sulphuric acid ($6\frac{1}{2}$ oz.) with water (10 oz.), and dissolve bichromate of potassium (9 oz.) in water ($3\frac{1}{2}$ pints) with the aid of heat. When both liquids are cold, mix them with fusel oil (4 oz.) in a matrass with occasional brisk agitation, until the temperature of the mixture has fallen to about 90°. Connect the matrass with a condenser, and distil until about half a gallon of liquid has passed over. Saturate the distilled liquid accurately with solution of soda, remove any oil (amylic alcohol) which floats on the surface, evaporate till watery vapour ceases to escape, and then raise the heat cautiously, so as to liquefy the salt. When the product has cooled and solidified, break it into pieces, and immediately put it into a stoppered bottle. By the action of sulphuric acid on the bichromate, chromic acid is liberated. This, being a powerful oxidiser, converts the amylic alcohol ($C_5H_{12}O$) into valerianic acid; and the chromium of the chromic acid and the potassium uniting with the sulphuric acid form a double sulphate of chromium and potassium:—$2K_2CrO_4,Cr,O_3 + 3C_5H_{12}O + 8H_2SO_4 = 3HC_5H_9O_2 + 11H_2O + 2(K_2SO_4,Cr_23SO_4)$. The valerianic acid acts on an unchanged portion of the amylic alcohol, forming valerianate of amyl, and the latter is converted by the soda into valerianate of sodium and amylic alcohol, which is thus regenerated.

Chloride of Sodium.

Abundantly distributed in nature, in the solid condition as "rock-salt," and in solution in certain springs and in sea-water. Brine, when evaporated, yields "bay-salt," or "sea-salt."

CHARACTERS AND TESTS.

Sodium.

A soft metal, rapidly oxidising in the air, but showing a bright metallic surface when freshly cut. It attacks water or alcohol with evolution of hydrogen gas. Twenty-three grains, cautiously dissolved in water, requires for neutralisation at least 975 grain-measures of the volumetric solution of oxalic acid.

Soda Caustica.

Hard and greyish-white, very alkaline and corrosive. It imparts a yellow colour to flame (test for sodium), and its solution in water acidulated by nitric acid gives only scanty white precipitates with nitrate of silver and chloride of barium, showing presence of traces of chlorides and sulphates. It has not such an affinity for water as caustic potash. Forty grains dissolved in water leave scarcely any sediment, and require for neutralisation about 900 grain-measures of the volumetric solution of oxalic acid. If quite pure it should require 1,000 grain-measures.

Soda Tartarata.

In colourless transparent prisms, or halves of prisms, of the right rhombic order, generally eight-sided. Very soluble in water, and having a saline and slightly bitter taste. Heated with sulphuric acid it blackens, evolving inflammable gases and the odour of burnt sugar. It imparts a yellow colour to flame. A strong solution gives a crystalline precipitate of acid tartrate of potassium on the addition of a small quantity of acetic acid. One hundred and forty-one grains (half a molecule) heated to redness till gases cease to be evolved, leave an alkaline residue of carbonates of potassium and sodium, which requires for neutralisation 990 grain-measures (half a molecule) of the volumetric solution of oxalic acid.

Sodii Arsenias.

In colourless, efflorescent, transparent prisms, soluble in water. The solution is alkaline, giving white precipitates with chloride of barium ($Ba_3 2AsO_4$), chloride of calcium ($Ca_3 2AsO_4$), and sulphate of zinc ($Zn_3 2AsO_4$), and a brick-red precipitate with nitrate of silver (Ag_3AsO_4), all of which are soluble in nitric acid. Heated to 300° it loses 40·38 per cent. of its weight, its water of crystallisation being driven off. A watery solution of 12·4 grains of the residue, dissolved in water and acidulated with acetic acid, will require for complete precipitation at least 34 grains of acetate of lead. Some of the water of crystallisation escapes on exposure to air, leaving a product which is relatively stronger from containing less water.

Sodæ Biboras.

This, the old name of borax, is incorrect; its probable constitution is $2(NaBO_2), B_2O_3, 10H_2O$, that is, metaborate of soda, boracic anhydride, and water of crystallisation. It occurs in transparent colourless crystals, sometimes slightly effloresced with a weak alkaline reaction; insoluble in rectified spirit; sparingly soluble in water, but is rendered much more soluble by the presence of cream of tartar, and the mixture inspissates solution of gum-arabic or of Iceland moss. It is soluble in glycerine. Heated, it undergoes aqueous fusion, at a red heat forms a transparent glass bead, which is used as a flux in blow-pipe operations. A hot saturated solution, when acidulated with any of the mineral acids, lets fall, as it cools, a scaly crystalline deposit (boracic acid), the solution of which in spirit burns with a green flame. One hundred and ninety-one grains (half a molecule) dissolved in 10 fluid ounces of distilled water require for saturation 1,000 grain-measures of the volumetric solution of oxalic acid.

Sodii Bicarbonas.

In powder, or small opaque, irregular scales, white, of a saline, not unpleasant taste. Imparts a yellow colour to flame. Dissolves with much effervescence in diluted hydrochloric acid, forming a solution in which perchloride of platinum causes no precipitate, and which is thus distinguished from bicarbonate of potassium. A solution of the salt in cold water gives a white ($HgCO_3$), and not a coloured precipitate (HgO) with solution of perchloride of mercury, showing the absence of carbonate of sodium. When supersaturated with nitric acid, its solution scarcely precipitates with chloride of barium or nitrate of silver, showing the presence of mere traces of sulphates and chlorides. Eighty-four grains (1 molecule) exposed to a red heat, leave 53 of an alkaline residue of carbonate of soda (half a molecule), which requires for neutralisation 1,000 grain-measures of the volumetric solution of oxalic acid (half a molecule). Twenty grains of bicarbonate of soda will neutralise 16·7 grains of citric, or 17·8 grains of tartaric acid.

Sodii Bromidum.

A granular white crystalline powder, somewhat deliquescent, inodorous, with a saline taste, readily soluble in less than twice its weight of water, but much less so in spirit. Its aqueous solution mixed with a little chlorine water should colour chloroform red on being shaken with it. Ten grains of the dry salt require for complete decomposition about 960 grain-measures of the volumetric solution of nitrate of silver. It should not give the reaction for iodine with starch and solution of chlorine.

Sodii Carbonas.

In transparent, colourless, laminar crystals, of a rhombic shape, efflorescent, with a harsh alkaline taste and strong alkaline reaction. It imparts a yellow colour to flame, and dissolves with effervescence in diluted hydrochloric acid, forming a solution which does not precipitate with perchloride of platinum. It is distinguished from the bicarbonate by giving a yellow precipitate with corrosive sublimate, and a white precipitate with sulphate of magnesium. By heat it undergoes aqueous fusion, and then dries up, losing 63 per cent. of its weight, its water of crystallisation being driven off. When supersaturated with nitric acid, it precipitates only slightly with chloride of barium or nitrate of silver, showing the presence of traces merely of sulphates and chlorides. One hundred and forty-three grains (half a molecule) require for neutralisation at least 960 grain-measures of the volumetric solution of oxalic acid.

Sodii Hypophosphis.

A white granular salt, having a bitter nauseous taste. It is deliquescent; very soluble in water and in spirit, but insoluble in ether. At a red heat it ignites, emitting spontaneously inflammable phosphuretted hydrogen.

Sodii Hyposulphis.

Colourless crystals, with a mild saline taste; freely soluble in water. It dissolves insoluble silver salts, especially the chloride, with which it forms a very sweet solution. On the addition to its solution of a few drops of sulphuric acid, phur is precipitated, and it is thus distinguished from a solution of sulphite of sodium ($NaS_2H_2O_4 + H_2SO_4 = Na_2SO_4 + 2H_2O + SO_2 + S$). It discharges the red colour of iodine in solution, forming two colourless salts, iodide and tetrathionate of sodium :—

$$I_2 + 2Na_2H_2S_2O_4 = 2NaI + Na_2S_4O_6 + 2H_2O.$$

Sodii Iodidum.

A white crystalline deliquescent powder, with a bitter saline taste. It is readily soluble in water and spirit. With chlorine water it gives the iodine reaction with starch. The addition of tartaric acid and mucilage of starch to its aqueous solution does not develop a blue colour (absence of iodate). Solution of nitrate of silver added in excess affords a yellowish white precipitate, which, when shaken with diluted solution of ammonia, yields by subsidence a clear liquid, in which excess of nitric acid causes very little turbidity. Its aqueous solution is only faintly precipitated by the addition of saccharated solution of lime. Ten grains require for complete precipitation about 660 grain-measures of the volumetric solution of nitrate of silver.

Sodii Nitras.

In colourless obtuse rhombohedral crystals, slightly deliquescent, having a cooling saline taste. Thrown on the fire it deflagrates; warmed in a test-tube with sulphuric acid and copper wire, it evolves ruddy fumes (nitric peroxide, NO_2). It is soluble in about two parts of cold distilled water. The solution gives no precipitate with nitrate of silver or chloride of barium, proving absence of chlorides and sulphates.

Sodii Phosphas.

In large, transparent, colourless, oblique rhombic prisms, terminated by four converging planes, efflorescent, tasting like common salt. Sp. gr. 1·58. It imparts a yellow colour to flame. Soluble in water; insoluble in alcohol. Its solution has a faintly alkaline reaction, and, being tribasic, it gives a yellow precipitate with nitrate of silver (Ag_3PO_4), the resulting fluid acquiring an acid reaction :—$Na_2HPO_4 + 3AgNO_3 = 2NaNO_3 + Ag_3PO_4 + HNO_3$. Heated to dull redness, it loses 63 per cent. of its weight, leaving a residue of pyrophosphate, which, when dissolved in water, gives with chloride of barium a precipitate of pyrophosphate of baryta almost entirely soluble in diluted nitric acid, a slight residue indicating the presence of a little sulphuric acid.

Sodii Salicylas.

Small, colourless, or nearly colourless, crystalline scales, inodorous, and having a sweetish saline taste. Slightly, but completely, soluble in alcohol, readily soluble in water. The solutions are neutral or faintly acid to litmus. When ignited the salt evolves inflammable vapours, and a white residue remains, which effervesces with acids, and imparts an intense yellow colour to flame. Perchloride of iron colours a concentrated solution reddish-brown, and a dilute solution violet. If the aqueous solution be acidulated by nitric acid, and the precipitate be dissolved by rectified spirit, the mixture is not rendered more than faintly opalescent by chloride of barium or nitrate of silver. It dissolves without colouration or effervescence in cold sulphuric acid.

Sodii Sulphas.

In transparent oblique prisms; has a salt and bitter taste; effloresces on exposure to the air. Its solubility in water increases up to 92°, and then diminishes to 215°. It is insoluble in spirit. Exposed to heat in a porcelain crucible it loses 55·9 per cent. of water. Heated with solution of potash no odour of ammonia is evolved, and no precipitate is formed; showing the absence of ammonia, iron, and manganese. Imparts the yellow colour characteristic of sodium to flame. One hundred grains of it, dissolved in distilled water and acidulated with hydrochloric acid, give by the addition of chloride of barium a white precipitate of sulphate of barium, which, when it has been washed and dried, weighs 72·2 grains.

Sodii Sulphis.

Colourless transparent prisms, efflorescent in dry air, inodorous, with a cooling saline and sulphurous taste. It is readily soluble in water, very soluble in spirit. The aqueous solution has a neutral or faintly alkaline reaction, and if treated with hydrochloric acid evolves a sulphurous vapour, but does not become cloudy.

Sodii Sulphocarbolas.

Colourless, transparent rhombic prisms, inodorous, or nearly so, with a cooling, saline, and somewhat bitter taste. Readily soluble in water, less so in spirit, the solutions being neutral to litmus. On ignition it gives vapours of carbolic acid, and leaves a residue, the solution of which in water affords a white precipitate with chloride of barium, insoluble in hydrochloric acid. It imparts an intense yellow colour to flame. The dilute aqueous solution is rendered violet by solution of perchloride of iron; it should not at once be rendered turbid by chloride of barium.

Sodii Valerianas.

A white deliquescent salt, very soluble in water and in spirit, without alkaline reaction, and giving out a powerful odour of valerian on the addition of sulphuric acid.

Sodii Chloridum.

In small white crystalline grains, or transparent cubic crystals, usually more or less deliquescent, from the presence of some chloride of magnesium or chloride of calcium, with a purely saline taste, odourless, imparting a yellow colour to flame. Its solubility in water is but little affected by heat. It is insoluble in pure alcohol, but slightly soluble in rectified spirit. The aqueous solution is not precipitated by perchloride of platinum, thus distinguishing it from chloride of potassium. It gives with nitrate of silver a white precipitate ($AgCl$), soluble in ammonia, but insoluble in nitric acid. A solution is not precipitated by one of carbonate of ammonium, followed by solution of phosphate of sodium. The former test would detect lime, and the latter, in addition, would indicate magnesia. At a high temperature it is volatilised unchanged.

COMPOUNDS OF ZINC. [Zn = 65.]

Name.	B. P. Preps.	Strength.	Dose.	Action and Use.
ZINCI ACETAS Acetate of Zinc $Zn(C_2H_3O_2)_2.2H_2O$	—	—	1 to 2 grs. (as a tonic), 10 to 20 grs. (as an emetic)	In small doses, tonic and astringent; in large doses, emetic. Topically an astringent, *e.g.*, in ophthalmia and in chronic mucous discharges.
ZINCI CARBONAS Carbonate of Zinc $ZnCO_3(Zn2HO)_2.H_2O$	—	—	—	Locally astringent and desiccant. Employed in preparation of the acetate and oxide.
CALAMINA PREPARATA	—	—	—	Mildly astringent, used in face lotions and dusting powders.
Native Carbonate of Zinc	Unguent. Calaminæ	—	1 pt. in 5	
ZINCI CHLORIDUM Chloride of Zinc $ZnCl_2$	— Liq. Zinci Chloridi	— 366 grs. to 1 oz.	—	Externally escharotic, irritant, and astringent. Is a deodorant and antiseptic.
ZINCI OLEATUM	Unguent. Zinci Oleati	1 pt. in 2	—	Used externally as powder and ointment in same cases as the oxide.
ZINCI OXIDUM Oxide of Zinc ZnO	— Unguent. Zinci	— 1 pt. in 6½	2 to 10 grs. —	In small doses, tonic, antispasmodic, and astringent. Locally applied as an astringent to excoriated surfaces, and in many cutaneous diseases.
ZINCI SULPHAS Sulphate of Zinc, White Vitriol $ZnSO_4.7H_2O$	—	—	1 to 3 grs. (as a tonic), 10 to 30 grs. (as an emetic)	In small doses, tonic and astringent; in large doses, a direct emetic. Given in chorea, epilepsy, hysteria, etc.; in solution, used as an astringent lotion and injection.
ZINCI SULPHOCARBOLAS $Zn(C_6H_5SO_4)_2,H_2O$	—	—	—	Is not employed internally. Is used as an astringent injection in gonorrhœa and leucorrhœa.
ZINCI VALERIANAS Valerianate of Zinc $Zn(C_5H_9O_2)_2$	—	—	1 to 3 grs.	Nervine tonic and antispasmodic. Said to be an indirect anthelmintic.

PREPARATION.

Prepared Calamine.

Native carbonate of zinc, calcined in a covered earthen crucible at a moderate temperature, powdered, and freed from gritty particles by elutriation.

From **Zinc** are prepared :—

1. **Chloride of Zinc.**

Put granulated zinc (16 oz.) into a porcelain basin; add by degrees hydrochloric acid (44 oz.) previously mixed with distilled water (1 pint), and aid the action by gently warming it on a sand-bath until gas is no longer evolved. Boil for half an hour, supplying the water lost by evaporation, and allow it to stand on a cool part of a sand-bath for twenty-four hours, stirring frequently. Filter the product into a gallon bottle, and pour in solution of chlorine by degrees, with frequent agitation, until the fluid acquires a permanent odour of chlorine. Add carbonate of zinc (½ oz.) in small quantities at a time, and with renewed agitation, until a brown sediment appears. Filter through paper into a porcelain basin, and evaporate until a portion of the liquid, withdrawn on the end of a glass rod and cooled, forms an opaque white solid. Pour it out now into proper moulds, and when the salt has solidified, but before it has cooled, place it in closely-stoppered bottles. In this process chloride of zinc is formed by solution of the metal in hydrochloric acid ($Zn + 2HCl = ZnCl_2 + H_2$). Zinc sometimes contains iron. This is removed by the chlorine solution, by which the ferrous is converted into ferric chloride ($2FeCl_2 + Cl_2 = Fe_2Cl_6$). By the addition now of carbonate of zinc, ferric oxide is precipitated and chloride of zinc formed :—

$$Fe_2Cl_6 + 3ZnCO_3 = Fe_2O_3 + 3ZnCl_2 + 3CO_2.$$

2. **Sulphate of Zinc.**

Pour sulphuric acid (12 oz.) previously mixed with distilled water (4 pints) on granulated zinc (16 oz.) contained in a porcelain basin, and, when effervescence has nearly ceased, aid the action by a gentle heat. Filter the fluid into a gallon bottle, and add gradually, with constant agitation, solution of chlorine until the fluid acquires a permanent odour of chlorine. Add now, with continued agitation, carbonate of zinc (½ oz.) until a brown precipitate (ferric oxide) appears; let it settle, filter the solution, evaporate till a pellicle forms on the surface, and set aside to crystallise. Dry the crystals by exposure to the air on filtering paper placed on porous tiles. More crystals may be obtained by again evaporating the mother liquor. In this process sulphate of zinc is formed by solution of the metal in sulphuric acid ($Zn + H_2SO_4 = ZnSO_4 + H_2$). The sulphate of zinc is then purified from any ferrous sulphate which may be present by adding chlorine and carbonate of zinc :—

$$2FeSO_4 + Cl_2 + ZnCO_3,2ZnO = Fe_2O_3 + ZnCl_2 + 2ZnSO_4 + CO_2.$$

From **Sulphate of Zinc** are prepared :—

1. **Valerianate of Zinc.**

Dissolve sulphate of zinc (5½ oz.) and valerianate of sodium (5 ozs.) each in two pints of water; raise both solutions to near the boiling point, mix them, cool, and skim off the crystals which are produced. Evaporate the mother-liquor at a heat not exceeding 200°, till it is reduced to 4 ounces; cool again, remove the crystals which have formed, and add them to those which have been already obtained. Drain the crystals on a paper filter, and wash them with a small quantity of cold distilled water till the washings give but a very feeble precipitate with chloride of barium. Let them now be again drained, and dried on filtering paper at ordinary temperatures. In the process the following reaction occurs :—

$$ZnSO_4 + 2NaC_5H_9O_2 = Na_2SO_4 + Zn2C_5H_9O_2.$$

2. Carbonate of Zinc.

Dissolve carbonate of sodium ($10\frac{1}{2}$ oz.) in distilled water (1 pint) in a capacious porcelain vessel, and pour it into a solution of sulphate of zinc in water (1 pint), stirring diligently. Boil for fifteen minutes after effervescence has ceased, and let the precipitate subside. Then wash the precipitate in boiling water until the washings fail to give a precipitate with chloride of barium, showing complete removal of the sulphate of sodium formed. Dry the precipitate by the aid of a gentle heat.

On mixing the solutions in this process, sulphate of sodium and carbonate of zinc are formed ($ZnSO_4 + Na_2CO_3 = Na_2SO_4 + ZnCo_3$); but the latter begins to evolve carbonic acid as soon as it is precipitated, and when the effervescence is over two of every three molecules are converted into hydrated oxide :—

$$3ZnCO_3 + 3H_2O = ZnCO_3, 2ZnH_2O_2, H_2O + 2CO_2.$$

From **Carbonate of Zinc** are prepared :—

1. Acetate of Zinc.

Add carbonate of zinc (2 oz.) in successive portions to acetic acid (3 oz.) previously mixed with water (6 oz.) in a flask ; heat gently, add by degrees more of the acetic acid till the carbonate is dissolved ; boil for a few minutes, filter while hot, and set it aside for two days to crystallise. Decant the mother-liquor ; evaporate to one-half, and again set it aside for two days to crystallise. Place the crystals in a funnel to drain, then spread them on filtering paper on a porous tile, and dry them by exposure to air at ordinary temperatures. The following is the reaction :—

$$ZnCO_3,\ 2ZnH_2O_2 + 6HC_2H_3O_2 = 3(Zn2C_2H_3O_2) + 5H_2O + CO_2.$$

2. Oxide of Zinc.

Expose the carbonate in a loosely covered Hessian crucible to a dull red heat, until a portion taken from the centre and cooled no longer effervesces when dropped into dilute sulphuric acid :—

$$ZnCO_3,\ 2ZnH_2O_2 = 3ZnO + CO_2 + 2H_2O_2.$$

From **Oxide of Zinc** is prepared :—

Sulphocarbolate of Zinc.

Is obtained by heating a mixture of carbolic acid and sulphuric acid, saturating the product with oxide of zinc, evaporating and crystallising.

CHARACTERS AND TESTS.

Calamina Præparata.

A pale, pinkish-brown powder, without grittiness; almost entirely soluble with effervescence in acids.

Zinci Acetas.

Thin translucent and colourless crystalline plates, of a pearly lustre, with a sharp unpleasant taste; evolving acetic acid when decomposed by sulphuric acid; soluble in water, and the solution precipitated pure white (sulphide of zinc) by sulphuretted hydrogen. A dilute watery solution is not affected by chloride of barium or nitrate of silver, showing the absence of sulphates and chlorides; and, when slightly acidulated with hydrochloric acid, is not precipitated by sulphuretted hydrogen, proving the absence of arsenic, copper, lead, and cadmium. After it has been boiled for a few minutes with a little nitric acid, it yields with ammonia a white precipitate of hydrated oxide of zinc (ZHO, H_2O), entirely soluble without colour (absence of iron and copper) in an excess of the re-agent.

Zinci Carbonas.

White, tasteless, inodorous; insoluble in water; soluble, with effervescence and without residue, in diluted nitric acid. This solution is not affected by chloride of barium or nitrate of silver (absence of sulphates and chlorides), and gives with carbonate of ammonium a white precipitate, entirely soluble, without colour, in an excess of the re-agent, forming a solution which is precipitated white by sulphide of ammonium (characteristic of zinc salts).

Zinci Chloridum.

Colourless opaque rods or tablets, very deliquescent and caustic. Almost entirely soluble in water, alcohol, and ether. Its aqueous solution gives with sulphide of ammonium a white precipitate of sulphide of zinc; it also gives a white precipitate with nitrate of silver ($AgCl$). If first acidulated with hydrochloric acid, it is not affected by sulphuretted hydrogen (distinction from lead and cadmium). Its aqueous solution should not give a precipitate with chloride of barium or oxalate of ammonium, showing the absence of sulphates and of lime; it should not be tinged blue by ferro- or ferricyanide of potassium, proving freedom from iron. Ammonia gives with its solution a white precipitate of hydrated oxide of zinc, which is entirely soluble in excess of the re-agent.

Zinci Oxidum.

A soft, nearly white, tasteless, and inodorous powder, becoming pale yellow when heated. Dissolves without effervescence (absence of carbonate) in diluted nitric acid, forming a solution, which is not affected by chloride of barium or nitrate of silver (absence of sulphate or chloride), and gives with carbonate of ammonium a white precipitate of carbonate of zinc, which dissolves entirely, without colour, in an excess of the re-agent, forming a solution which is precipitated white by sulphide of ammonium.

Zinci Sulphas.

In colourless transparent prisms, isomorphous with sulphate of magnesium; efflorescent; soluble in water. It is precipitated and again redissolved by ammonia; gives white precipitates with chloride of barium and with sulphide of ammonium. Its solution should not be tinged purple by tincture of galls, showing freedom from iron. When acidulated with hydrochloric or sulphuric acid, it should not be precipitated by sulphuretted hydrogen, showing the absence of arsenic, copper, and lead. Boiled for a few minutes with a little nitric acid, it yields with ammonia a white precipitate (oxide of zinc) entirely soluble (absence of iron), without colour (absence of copper), in excess of the re-agent.

Zinci Valerianas.

In brilliant white pearly tabular crystals, with a feeble odour of valerianic acid, and a metallic taste; scarcely soluble in cold water or in ether; soluble in hot water and alcohol. Heated to redness in an open crucible, it leaves a residue of oxide of zinc, which, when dissolved in diluted sulphuric acid, yields with ammonia a precipitate which entirely dissolves in an excess of the re-agent, and the resulting solution gives a white precipitate with sulphide of ammonium. Its solution in hot water is not precipitated by chloride of barium, showing the absence of sulphate. It gives, when heated with diluted sulphuric acid, a distillate which, when mixed with the solution of acetate of copper, does not immediately affect the transparency of the fluid, but forms after a little time oily drops, which gradually pass into a bluish-white crystalline deposit, showing the absence of butyric acid.

It has been pointed out that commercial valerianate of zinc consists principally of butyrate of zinc; hence the necessity for the latter test.

Paraffinum Durum.

Preparation.—Hard paraffin, or paraffin wax, is obtained by distillation from shale, separation of the liquid oils by refrigeration, and purification of the solid products.

Characters and Tests.—Colourless, semi-transparent, crystalline, inodorous, and tasteless; slightly greasy to the touch. Specific gravity 0·82 to 0·94. Insoluble in water, slightly soluble in absolute alcohol, freely so in ether. Melts at 110° to 145° F., and burns with a bright flame, leaving no residue.

Paraffinum Molle.

Preparation.—Soft paraffin, or vaseline, is usually prepared by purifying the less volatile portions of petroleum.

Characters and Tests.—White or yellowish, translucent, soft, greasy, free from acidity, alkalinity, or any unpleasant odour or flavour, even when warmed to 120° F. Specific gravity at melting-point from about 0·840 to 0·870. Melts at 95° to 105° F., or even somewhat higher; volatilises without giving acrid vapours, and burns with a bright flame, leaving no residue. Insoluble in water; slightly soluble in absolute alcohol; freely soluble in ether, chloroform, benzol, etc. Is not saponified by solutions of alkalies.

ORGANIC SUBSTANCES.

VEGETABLE KINGDOM.

RANUNCULACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
ACONITUM NAPELLUS Monkshood (*Germany and Britain*)	*a.* The fresh leaves and flowering tops. *b.* The dried root	Extract. Aconiti Linimentum Aconiti Tinctura Aconiti Aconitina Unguent. Aconitinæ	— 1 to 1½ oz. 1 pt. in 8 — 8 grs. to 1 oz.	1 to 2 grs. — 5 to 15 mins. (?) — —	A cardiac sedative. Lessens the force and rapidity of the circulation. Diaphoretic. Locally relieves rheumatic and neuralgic pain. Used to reduce pyrexia.
CIMICIFUGIA RACEMOSA Actæa Racemosa (*North America*)	Dried rhizome and rootlets	Extractum Cimicifugæ liquidum Tinct. Cimicifugæ	1 pt. in 1 1 pt. in 8	3 to 30 mins. 15 to 60 mins.	Acts like digitalis, but is less powerful. It is used in the treatment of rheumatism, chorea, and neuralgia.
PODOPHYLLUM PELTATUM American May-apple or Mandrake (*North America*)	The dried rhizome	Resina Podophylli Tinctura Podophylli	— 1 gr. in 1 drm.	¼ to 1 gr. 15 to 30 mins.	Purgative and cholagogue. Acts chiefly on duodenum. Useful in chronic constipation.
DELPHINIUM STAPHISAGRIA Stavesacre (*Southern Europe*)	The dried seeds	Unguent. Staphisagriæ	10 p. c. of the oil	—	Paralyses the motor nerves like curare, slows pulse and respiration. Externally it is used to destroy pediculi.

Aconitum.

The fresh leaves and flowering tops are gathered when the flowers are about one-third expanded. The leaves are smooth, palmate, divided with fine deeply-cut wedge-shaped segments, exciting when chewed a tingling sensation. The flowers are numerous, irregular, with a helmet-shaped petaloid calyx; the petals are two, the rest being abortive. The flowers are deep blue, and occur in dense racemes.

The root is collected in winter or early spring, before the leaves have appeared. It is generally from one to three inches long—not thicker than the finger at the crown—tapering, with numerous fibres proceeding from the sides; it is blackish-brown without, and whitish within; it causes tingling and numbness when cautiously chewed.

The root has been mistaken for horseradish and Jerusalem artichoke. The differences between it and horseradish are thus tabulated by Prof. Bentley:

Aconite.	*Horseradish.*
Form.—Conical, tapering rapidly to a point.	*Form.*—Slightly conical at the crown; then cylindrical, or nearly so, and almost of the same thickness for many inches.
Colour.—Coffee-coloured, or more or less brownish, externally.	*Colour.*—Externally white, or with a yellow tinge.
Odour.—Merely earthy.	*Odour.*—Especially developed on scraping, when it is very pungent and irritating.
Taste.—At first bitter, but afterwards producing a disagreeable tingling and numbness.	*Taste.*—Bitter or sweet, according to circumstances, and very pungent.

Aconite contains an alkaloid, *Aconitina,* united with *Aconitic Acid,* and a base, *Aconella,* which resembles *Narcotine* in composition and proportion.

Aconitina is a white, usually amorphous solid, soluble in 150 parts of cold water, in 50 of hot water; in 6 of rectified spirit, and entirely soluble in 25 of pure ether. Its solution in ether should leave no residue when burned with free access of air. It is alkaline, neutralises acids, and is precipitated from them by caustic alkalies, but not by carbonate of ammonium, or by bicarbonates of potassium or sodium. It melts on heating, and burns with a smoky flame. It is sometimes mixed with Delphinia, and sometimes contains Aconella.

Amorphous Aconitine from Germany is very impure, and, comparatively speaking, of little potency. The English Aconitine is much more powerful, and is obtained mostly from *A. ferox*, Nepaul Aconite, or Bikh root, which is three times stronger than A. napellus. It probably owes its potency to *Pseud-aconitina*, which is perhaps a mixture of amorphous and crystalline aconitina.

Cimicifuga.

The rhizome is from two to six inches long, half an inch to an inch thick, somewhat flattened, cylindrical, with the remains of several aërial stems above, and small wiry, brittle, branched rootlets, or portions of rootlets, below. Colour of rhizome and rootlets brownish-black. Fracture short, the rootlets presenting a thick bark and a triangular, crosslike or stellate arrangement of woody tissue. They contain, when fresh, a volatile oil, a resin, and a bitter neutral substance.

Podophyllum.

The rhizome occurs in pieces of variable length, about two inches thick, wrinkled longitudinally, jointed, dark reddish-brown externally, whitish within, breaking with a short fracture, giving off from the sides pale brown rootlets. The stem bears a pendant fragrant white flower, and two large peltate palmate-lobed leaves. The fruit is a large oval fleshy berry, sometimes called "wild lemon," from its form and colour. The different parts of the flower have different properties, the fruit being subacid and innocuous, the leaves poisonous, and the rhizome powerfully purgative.

The powdered rhizome resembles jalap in appearance, is yellowish-gray, with a sweetish odour and a bitterish subacid nauseous taste. It contains resinous matters, gum, and other substances soluble in water. *Berberine* is stated to exist in the rhizome, and to be contained in commercial Podophylline. Berberine is found in Berberis vulgaris, the Common Barberry, and should not be confounded with Beberine, the alkaloid of Bebeeru (Nectandra) bark, N.O. Lauraceæ. It is also contained in large quantities in Hydrastis Canadensis and in other Ranunculaceæ, and in Calumba. Podophyllum also contains a non-purgative bitter crystalline alkaloid, an odoriferous principle, which sublimes in colourless scales, and *Saponin* (p. 162).

The resin Podophylline, which constitutes about 3½ to 5 per cent. of the rhizome, is a pale greenish-brown amorphous powder, soluble in rectified spirit and ammonia, and precipitated from the former by water, and from the latter by acids. It is almost entirely soluble in pure ether. The pure resin is white, the colour of the ordinary resin being probably due to the presence of berberine. It is said to be a mixture of two resinous substances, the one soluble in ether, the other insoluble. Like jalap resin, podophylline is insoluble in oil of turpentine.

Staphisagria.

The seed is irregularly triangular, or obscurely quadrangular, arched, of a brownish-black colour, deeply pitted on the surface.

They contain two alkaloids, *Delphinine* and *Staphisagrine*, together with resin, fatty matter, etc.

MAGNOLIACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
ILLICIUM ANISATUM Star-anise (*China*)	The fruit	Oleum Anisi Essentia ,,	— 1 vol. in 5	— 10 to 20 mins.	Aromatic, stimulant, and carminative. Used to relieve flatulence, and to prevent aperient medicines griping.

The oil yielded by the distillation of the fruit of Illicium anisatum—the Star-anise, distilled in China—resembles true anise oil, which is obtained from the fruit of Pimpinella anisum, an Umbelliferous plant (p. 209).

MENISPERMACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
JATEORRHIZA CALUMBA Calumba (*Eastern Africa*)	The dried root	—	—	5 grs.	Bitter, stomachic tonic. Contained in Mist. Ferri Aromat.
		Extractum Calumbæ	2½ ozs. from 1 lb.	2 to 10 grs.	
		Infusum Calumbæ	1 oz. to 1 pt.	1 to 2 ozs.	
		Tinctura Calumbæ	2½ ozs. to 1 pt.	½ to 2 drms.	
CHONDRODENDRON TOMENTOSUM Pareira root (*Brazil*)	The dried root	Decoct. Pareiræ	1½ oz. to 1 pt.	1 to 2 ozs.	Stimulating diuretic. Useful in catarrh of the bladder, calculous affections, and pyelitis.
		Extractum Pareiræ	—	10 to 20 grs.	
		Ext. Pareiræ Liquid.	2 drms. of Ext. in 1 oz.	½ to 2 drms.	

Calumba.

The root is cut transversely into flat circular or oval slices, which become concavo-convex in drying ; they are about two inches in diameter and from two to four lines thick. They are thinner and softer in the centre, and of a yellow colour, the outer portion being dark green or olive. They have a bitter taste and a slightly aromatic odour. A decoction, when cold, is blackened by solution of iodine, owing to presence of starch, in which the root is particularly rich.

Calumba root contains a neutral crystallisable principle, *Calumbine* ($C_{21}H_{22}O_7$), which is slightly soluble in water or proof spirit, and freely soluble in alkaline solutions and in dilute acetic acid ; *Calumbic acid* ($C_{21}H_{21}O_7$), a yellow amorphous substance, feebly soluble in cold water ; and an alkaloid, *Berberine* ($C_{20}H_{17}NO_4$), the salts of which are soluble and yellow, and give the colour to the root. Calumbate of berberine is contained in the infusion and tincture. Calumba root also contains a little resinous extract and a trace of volatile oil. It contains neither tannic nor gallic acid, and hence may be given with salts of iron. The infusion, which is made with cold water, does not contain starch, and hence does not strike blue with iodine.

White bryony root tinged with tincture of turmeric, and the root of American calumba (Frasera Walteri), have been substituted for true calumba; they, however, contain but little starch, and when moistened do not strike blue with tincture of iodine. The latter plant also differs from calumba in not containing tannin. False calumba (Coscinium fenestratum) has also been substituted for calumba, but it likewise contains very little starch.

Pareira.

The root of Pareira brava occurs in cylindrical oval or compressed pieces, entire or split longitudinally, half an inch to four inches in diameter, and from four inches to four feet in length. The bark is grayish-brown, longitudinally wrinkled, crossed transversly by annular elevations; interior is woody, yellowish-gray, porous, with well-marked, often incomplete, concentric rings and medullary rays. Taste is at first sweetish and aromatic, afterwards intensely bitter.

Hanbury thinks that true pareira root is the root of the Chondrodendron tomentosum. The root and stem of Cissampelos pareira have no concentric rings.

Pareira root contains a crystalline principle, *Pelosine* or *Cissampeline* ($C_{18}H_{21}NO_3$), a strong base isomeric with *Codeine*, and said to be identical with *Beberine*. It is soluble in alcohol and ether; insoluble in water, but swells up with it, and forms a hydrate, which becomes yellow, and is decomposed, on exposure to air and light. It combines with acids, forming salts, which are soluble in water. Besides this principle, pareira contains resin, a bitter yellow matter, starch, salts, etc.

PAPAVERACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
Papaver Somniferum The White Poppy (Cultivated in *Britain*)	The nearly dried ripe capsules	Decoct. Papaver	2 ozs. to 1 pt.	—	Mild anodyne and soporific
		Extractum Papaver	1 pt. from 3	2 to 5 grs.	
		Syrupus Papaver	1 pt. to 3	1 to 6 drms.	
Opium Papaver Somniferum (Grown in *Asia Minor*)	Inspissated juice from incisions in unripe capsules	Pulvis Opii*	—	½ to 2 grs.	Anodyne, soporific, narcotic, sedative, antispasmodic, sudorific, and astringent.
		Confectio Opii	1 in 40, nearly	5 to 20 grs.	
		Emplastrum Opii	1 in 10	—	
		Enema ,,	½ dr. Tinct. to 2 ozs.	—	
		Extractum Opii	About 1 pt. from 2	½ to 2 grs.	
		Extract. Liquid.	22 grs. Ext. in 1 oz.	10 to 40 mins.	
		Liniment. Liquid.	1 vol. Tinct. in 2 vols.	—	
		Pil. Ipecac. cum Scilla	1 pt. in 23½, nearly	5 to 10 grs.	
		Pil. Plumbi cum Opio	1 pt. in 8	3 to 5 grs.	
		Pil. Saponis Co.	1 pt. in 6, nearly	3 to 5 grs.	
		Pulv. Cretæ Ar. cum Opio	1 pt. in 40	10 to 40 grs.	
		Pulv. Ipecac. Co.	1 pt. in 10	5 to 15 grs.	
		Pulv. Kino Co.	1 pt. in 20	5 to 20 grs.	
		Pulv. Opii Co.	1 pt. in 10	2 to 5 grs.	
		Suppos. Plumbi Co.	1 gr. in each	—	
		Tinct. Camph. Co.	2 grs. to 1 oz.	15 mins. to 1 drm.	
		Tinct. Opii	33 grs. to 1 oz., nearly	5 to 40 mins.	
		Tinct. Opii Ammoniata	5 grs. to 1 oz.	½ to 1 drm.	
		Trochisi Opii	$\frac{1}{10}$ gr. Ext. in each	1 to 6	
		Ung. Gallæ cum Opio	32 grs. to 1 oz.	—	
		Vinum Opii	22 grs. Ext. in 1 oz., nearly	10 to 40 mins.	
Papaver Rhœas Red Poppy (*Britain*)	The fresh petals	Syrupus Rhœados	—	1 drm.	Slightly sedative. A colouring agent.

---

* All the preparations containing opium are here grouped together.

Papaveris Capsulæ.

Are globular, two or three inches in diameter, smooth, pale brownish-yellow, crowned by a sessile stellate stigma. The placentæ are parietal, and bear many small pale brownish reniform seeds. The capsules contain in small quantity the principles found in opium. The seeds contain much bland oil, but are devoid of narcotic properties. When unripe, the capsules contain more opium.

Opium.

Opium is obtained by making incisions into the unripe capsules of the poppy, before the petals have fallen, taking care not to penetrate to the interior; the milky juice which exudes soon becomes brown and is inspissated by spontaneous evaporation. It occurs in irregular lumps, weighing from 4 ounces to 2 pounds, enveloped in the remains of poppy leaves, and generally covered with the chaffy fruits of a species of rumex. When fresh, it is plastic, tearing with an irregular slightly-moist chestnut-brown surface, shining when rubbed smooth with the finger, having a peculiar odour and bitter taste.

The chief varieties of opium are—Turkey, Egyptian, and East Indian. Persian and European (French, German, and English) opium is also met with.

Turkey Opium is the officinal variety; there are two kinds of it—viz., *Smyrna* opium and *Constantinople* opium. The former occurs in more or less flattened masses, weighing from a quarter of a pound to two pounds; it is covered with rumex capsules; when fresh, it is soft and rich brown internally, and has a heavy narcotic odour and bitter taste. It is made up of agglutinated tears. Good Smyrna opium should yield ten per cent. of morphine; it is sometimes adulterated with salep powder, which causes the tincture to assume a mucilaginous consistence. The Constantinople opium occurs in small lenticular masses, weighing from a quarter to half a pound, often enclosed in a poppy leaf, of which the midrib is prominent, but, according to Pereira, never covered with the rumex capsules.

Egyptian Opium is met with in flat, more or less circular, cakes, about one to three inches in diameter, covered with a leaf, which is probably that of a palm; it is hard and dark brown internally, and emits a musty narcotic odour. It is inferior to Turkey opium, yielding from six to seven per cent. of morphine; it is particularly rich in meconic acid.

East Indian Opium, also known as Bengal or Benares opium, and sometimes termed Chinese investment opium, occurs in round balls, weighing about four pounds, covered with a thick coating of poppy leaves; internally, it is blackish and soft. It also occurs in cakes, called Malwa or Garden Patna opium. It is inferior to Turkey opium, yielding on an average from three to eight per cent. of morphine. It is not met with in English commerce.

Opium is extensively adulterated, the chief impurities being moisture, sand, stones, leaves, woody-fibre, seeds, charcoal, dung, etc.; these may be detected by subjecting the opium to a searching physical examination. Flour is sometimes used to adulterate opium, and may be detected by the iodine test; opium so adulterated quickly becomes sour. Juices of various plants, extracts—as of tobacco, Indian hemp, fruit-pulp, etc.—are also met with as impurities of opium.

Alkalies precipitate the alkaloids from opium, but redissolve them in excess; lime, magnesia, and tannic acid also precipitate the opium alkaloids—a fact which should be remembered in prescribing.

The **Acids** derived from opium are:—

Meconic - -	- $H_3C_7HO_7.3H_2O$
Thebolactic -	- $C_3H_6O_3$

Meconic Acid crystallises in pearly scales; is soluble in water; is tribasic, and forms insoluble salts with lead, lime, and barium. With neutral persalts of iron it gives a blood-red colour, which is not bleached by solution of corrosive sublimate, as is the similar red colour of ferric sulphocyanate. In testing for it, solution of acetate of lead is added to the filtered liquor; meconate of lead and acetate of morphine are thus formed; the former is decomposed by sulphuretted hydrogen; the resulting sulphide of lead being precipitated, the meconic acid is set free and can be separated by filtration. Opium yields on an average from six to eight per cent. of meconic acid, which is believed to be an inert substance.

Thebolactic Acid is isomeric, or perhaps identical, with lactic acid. Turkey opium contains two per cent.

The **Alkaloids** of opium are:—

(*a*) *Primary.*—	*Morphina*	$C_{17}H_{19}NO_3$
	Codeina	$C_{18}H_{21}NO_3$
	Codamine	$C_{20}H_{25}NO_4$
	Laudanine	$C_{20}H_{25}NO_4$
	Pseudomorphine	$C_{17}H_{19}NO_4$
	Papaverine	$C_{21}H_{21}NO_4$
	Rhœadine	$C_{21}H_{21}NO_6$
	Lanthopine	$C_{23}H_{25}NO_4$
	Cryptopine	$C_{21}H_{23}NO_5$
	Meconidine	$C_{21}H_{23}NO_4$
	Thebaine	$C_{19}H_{21}NO_3$
	Narcotine	$C_{22}H_{23}NO_7$
	Opianine	$C_{66}H_{72}N_4O_{21}$
	Porphyroxine	——
(*b*) *Derived.*—	Apomorphine	$C_{17}H_{17}NO_2$
	Apocodeina	$C_{18}H_{19}NO_2$
	Rhœagenine	——
	Cotarnine	$C_{11}H_{10}(CH_3)NO_3$

The **Neutral Bodies** yielded by opium are :—

Narceia	$C_{23}H_{29}NO_9$
Meconine	$C_{10}H_{10}O_4$

Besides the principles enumerated above, opium contains different resins, gummy, extractive, and fatty matters, caoutchouc, a trace of volatile oil, etc.

Of these, the following preparations are alone officinal :—

Name of Preparation.	Strength.	Dose.
MORPHINÆ ACETAS	About 1 part from 8 or 10 of Opium	$\frac{1}{8}$ to $\frac{1}{2}$ gr.
Injectio Morphinæ Hypodermica	1 gr. in 10 mins.	1 to 5 mins.
Liquor Morphinæ Acetatis	1 pt. in 100	10 to 40 mins.
MORPHINÆ HYDROCHLORAS	About 1 part from 8 or 10 of Opium	$\frac{1}{8}$ to $\frac{1}{2}$ gr.
Liquor Morphinæ Bimeconatis	$5\frac{1}{2}$ grs. to 1 oz.	5 to 40 mins.
Liquor Morphinæ Hydrochloratis	1 pt. in 100	10 to 40 mins.
Suppositoria Morphinæ	$\frac{1}{2}$ gr. in each	—
Suppos. Morph. cum Sapone	$\frac{1}{2}$ gr. in each	—
Tinct. Chloroformi et Morphinæ	1 gr. to 1 oz.	5 to 10 mins.
Trochisci Morphinæ	$\frac{1}{36}$ gr. in each	1 to 6
Troch. Morph. et Ipecac.	$\frac{1}{36}$ gr. in each	1 to 6
MORPHINÆ SULPHAS	—	—
APOMORPHINÆ HYDROCHLORAS	—	—
Injectio Apomorphinæ Hypodermica	2 grs. in 100 mins.	$\frac{1}{25}$ to $\frac{1}{6}$ gr.
CODEINA	—	$\frac{1}{4}$ to 2 grs.

Morphine.

Is isomeric with *Piperine.* Crystallises in six-sided prisms; it is soluble in alcohol, and is distinguished from other fixed alkaloids by its solubility in alkaline solutions; it is very slightly soluble in ether or water. Morphine is extremely sensitive to the action of oxidising agents. It liberates iodine, and hence blues starch when added to iodic acid. It and its salts give a blue or greenish-blue colour with persalts of iron. Nitric acid converts it into oxalic acid, with development of an orange-red colour which changes to yellow. Fröhde's reagent (solution of molybdate of sodium in strong sulphuric acid—" sulphomolybdic acid ") gives a blue colour; and Husemann's test consists in the addition of nitric acid or chlorine to a warmed solution of morphine in sulphuric acid; in this case also a violet or blue colour is developed.

Morphine exists in opium combined with meconic acid; on testing for it, therefore, solution of acetate of lead is added to the filtered liquor to form acetate of morphine and meconate of lead; the latter, being insoluble, is filtered off, and to the filtrate, which contains the acetate of morphine, sulphuretted hydrogen is added, to convert any acetate of lead into insoluble sulphide of lead, readily separated by filtration. The filtrate is now slightly warmed, to drive off the sulphuretted hydrogen, and the solution is available for the application of tests.

The following is the pharmacopœial test for estimating the quantity of morphine present in opium:—Take of opium dried at 212° F. 140 grains, freshly slaked lime 60 grains, triturate them in a mortar with 400 grain-measures of distilled water until uniformly mixed, then add 1000 grain-measures of distilled water and stir occasionally during half-an-hour. Filter the mixture through a plated filter about three inches in diameter into a wide-mouthed bottle or stoppered flask (having the capacity of about 6 fluid oz. and marked at exactly 1040 grain-measures) until the filtrate reaches this mark. To the filtered liquid (representing 100 grains of opium) add 110 grain-measures of rectified spirit and 500 grain-measures of ether, and shake the mixture; then add 40 grains of chloride of ammonium, shake well and frequently during half-an-hour, and set it aside for twelve hours. Counterbalance two small filters; place one within the other in a small funnel, and decant the ethereal layer as completely as possible upon the inner filter. Add 200 grain-measures of ether to the contents of the bottle and rotate it; again decant the ethereal layer upon the filter and afterwards wash the latter with 100 grain-measures of ether added slowly and in portions. Now let the filter dry in the air and pour upon it the liquid in the bottle in portions, in such a way as to transfer the greater portion of the crystals to the filter. When the liquid has passed through the filter, wash the bottle and transfer the remaining crystals to the filter with several small portions of distilled water, using not more than 200 grain-measures in all, and distributing the portions evenly upon the filter. Allow the filter to drain, and dry it, first by pressing between sheets of bibulous paper and afterwards at a temperature between 131° and 140° F., and finally at 194° to 212° F. Weigh the crystals in the inner filter, counterbalancing by the outer filter. The crystals should weigh 10 grains, or not less than $9\frac{1}{2}$ grains, and not more than $10\frac{1}{2}$ grains, corresponding to about 10 per cent. of morphine in the dry powdered opium.

Acetate of Morphine.

Crystallises in fine needles; generally occurs as a white powder; is apt to lose part of its acid on keeping; is soluble in $2\frac{1}{2}$ parts of water and readily in alcohol, and its aqueous solution gives, with solution of caustic potash, a precipitate which is redissolved with excess. Acetate of morphine is affected by nitric acid and perchloride of iron similarly to the hydrochlorate. It develops an acetous odour on the addition of sulphuric acid. Twenty grains in a drachm of water, cleared by 1 grain of acetic acid, yields a precipitate with ammonia in slight excess, which when washed and dried weighs 15 grains. (For mode of preparation of this and the following salt, see Part II.)

Hydrochlorate of Morphine.

Occurs in silky acicular crystals; soluble in about 20 parts of water; soluble also in spirit. When pure, it is entirely dissipated by heat. Its aqueous solution gives a white precipitate with nitrate of silver ($AgCl$) and also with potash, the latter being soluble in excess of the alkali. When moistened with strong nitric acid, it becomes orange-red, and with solution of perchloride of iron it gives a greenish-blue. Twenty grains dissolved in half an ounce of warm water, with ammonia added in the slightest possible excess, give on cooling a crystalline deposit, which, when washed with a little cold water and dried in a water-bath, weighs 16 grains.

Sulphate of Morphine.

Colourless, silky, acicular crystals, soluble in 24 parts of water, sparingly in rectified spirit. From its solution, potash gives a precipitate which is soluble in excess, chloride of barium a white precipitate insoluble in hot hydrochloric acid (sulphuric acid test). Moistened with strong nitric acid, it becomes orange-red; and with solution of perchloride of iron, greenish-blue (tests for morphine).

Codeine.

In almost colourless octahedral crystals; soluble in 80 parts of water and of solution of ammonia; readily in spirit and in dilute acids. The aqueous solution has a bitter taste and an alkaline reaction. The alkaloid dissolves in sulphuric acid, forming a colourless solution, which, when gently warmed with molybdate of ammonium, or a trace of perchloride of iron, assumes a deep blue colour. Moistened with strong nitric acid it becomes yellow, but not red. Ignited in air it gives no ash.

Hydrochlorate of Apomorphine.

Is obtained by heating morphine in a closed tube for several hours at a temperature of 280° to 300° F., with excess of hydrochloric acid. Small, grayish-white, shining, acicular crystals, turning green on exposure to light and air; inodorous, with a very faint acid reaction on moistened litmus paper. Soluble in 7 (70 ?) parts of water, and 50 parts of alcohol, the solutions being decomposed with productions of a green colour when they are boiled. From solutions bicarbonate of sodium throws down a precipitate, which becomes green on standing, and then forms a purple solution with ether, violet with chloroform, and bluish-green with alcohol. With dilute solution of perchloride of iron it gives a deep red, and with nitric acid a blood-red colouration.

Codamine.—Soluble in alcohol, ether, and boiling water. Yields a dark-green solution with nitric acid.

Laudanine forms stellate groups of small colourless six-sided prisms. Soluble in chloroform and benzol. Turns orange-red with nitric acid.

Morphine and the three preceding alkaloids form an homologous series.

Pseudomorphine forms a fine white crystalline precipitate; insoluble in alcohol, ether, or water. Gives with nitric acid an orange-red solution, which turns to yellow.

Papaverine occurs in delicate, colourless, tasteless prisms, which have no action on litmus; slightly soluble in water; soluble in dilute hydrochloric and acetic acids. With cold nitric acid, gives a bright orange colour; with sulphuric acid it forms a solution which is colourless at first, but which becomes purple and finally purplish-red on heating. Opium yields about 1 per cent.

Rhœadine.—Small white prisms; nearly insoluble in alcohol, chloroform, ether, and water. Tasteless and non-poisonous.

Lanthopine.—Small white prisms; insoluble in alcohol and water; soluble in chloroform; tasteless; has no action on litmus. Is homologous with papaverine.

Cryptopine.—Colourless six-sided crystals; scarcely soluble in ether or water, but readily soluble in chloroform. Forms neutral and acid salts, which have a bitter taste. With strong sulphuric acid it gives a blue colour which, on the addition of nitre, turns to orange-red.

Meconidine.—A brownish resinoid mass, which readily splits up into laminæ. Tasteless. Soluble in alcohol, chloroform, and ether; insoluble in water. The alcoholic solution blues litmus. Its salts are very unstable.

Thebaine or Paramorphine.—Crystallises in square lustrous plates of an acrid or styptic taste. Soluble in alcohol, chloroform, and ether; insoluble in water. Gives a blood-red colour with cold sulphuric acid, with a mixture of sulphuric and nitric acids, and with Fröhde's reagent. With nitric acid it gives a yellow.

Narcotine.—Brilliant prisms; soluble in alcohol, ether, and acids; slightly soluble in boiling water; insoluble in cold water or alkalies. Heated with water it splits up into meconine and cotarnine. With nitric acid it gives yellow; with hot sulphuric acid it gives a blue, which changes to red; with a mixture of nitric and sulphuric acids it gives a red, and with Fröhde's reagent it gives a green colour, which changes to reddish. Opium yields an average percentage of 6 to 8.

Opianine resembles, and perhaps is identical with, narcotine. It has been found only in Egyptian opium.

Rhœados Petala.

These should be collected immediately after expansion. When fresh, they have a bright scarlet colour, which changes to dusky-red on drying; they have a slightly bitter taste and a narcotic poppy-like odour, which is also lost on drying. A crystallisable, colourless, tasteless, non-poisonous alkaloid, *Rhœadin* ($C_{21}H_{21}NO_6$), is present, and is soluble only in acids. The red colouring matter is said by Meier to consist of two amorphous acids, *Rhœadic* and *Papaveric;* it is turned a dark violet or brown by perchloride of iron, is brightened by acids, and rendered dark by alkalies, being thus distinguished from the colouring matter of red cabbage, which is turned green by alkalies.

CRUCIFERÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
SINAPIS NIGRA; SINAPIS ALBA (*Indigenous*)	The seeds of each. Also the seeds reduced to powder and mixed	Cataplasma Sinapis	—	—	Rubefacient. Employed as a counter-irritant. Internally, the powder, in doses of i. oz. or more, is emetic.
		Charta Sinapis	—	—	
		Oleum Sinapis	—	—	
		Lin. Sinapis Co.	1 pt. oil in 41	—	
COCHLEARIA ARMORACIA Horseradish (*Britain*)	The fresh root	Spirit. Armoraciæ Compositus	1 in 8	1 to 2 drms.	Stimulant, sudorific, diuretic.

Sinapis.

Black mustard-seeds are small, round, brownish-black, wrinkled on the surface, and yellowish within. They are very likely to be mistaken for colchicum seeds, which, however, are lighter in colour and somewhat larger.

White mustard-seeds are larger than the black variety, and are yellow on the surface.

The seeds reduced to powder are the officinal part, and form a greenish-yellow mass, of an acrid, bitterish, oily, pungent taste, scentless when dry, but exhaling a very pungent, penetrating, irritating odour when moist. A decoction cooled is not made blue by tincture of iodine, showing the absence of starch.

The volatile oil is a colourless or pale-yellow fluid, becoming darker by age, and having the composition of *sulphocyanide of allyl* (C_3H_5CNS). It is one of the four officinal oils (cinnamon, cloves, pimento, and mustard) which are heavier than water, its specific gravity being 1·015. It is readily soluble in alcohol or ether, and to a slight extent in water. Has a very penetrating odour and an acrid burning taste. Applied to the skin, it produces almost instant vesication It is apt to contain a large proportion of cyanide of allyl (C_3H_5CN), the presence of which may be inferred when the density of the oil is less than that just mentioned. Oil of mustard can be artificially prepared by decomposing iodide of allyl (C_3H_5I) with sulphocyanide of potassium ($KCNS$). When oil of mustard is heated for a few hours in a sealed tube with potassic monosulphide, it is converted into oil of garlic and potassic sulphocyanide.

The black seeds contain *Myronate of Potassium* or *Sinigrin* and *Myrosine*, an albuminous ferment resembling diastase, and emulsine or synaptase, and these, in the presence of water at 120° F., yield the volatile oil, which, it must be remembered, does not pre-exist in the seed. Besides the volatile oil, glucose, and acid sulphate of potassium, both the black and white seeds contain from 25 to 35 per cent. of fixed oil. This is a yellowish, tasteless, odourless fluid, composed chiefly of olein and mucilage, and contains *Erucic acid* ($C_{22}H_{42}O_2$).

Flour of mustard is extensively adulterated with common flour, pepper, chilies, turmeric, capsicum powder, etc.

Armoracia.

The fresh root is long, cylindrical, fleshy, from half an inch to an inch in diameter, expanding at the crown into several very short stems. It is white internally, and has a pungent taste and odour when scraped. The characters distinguishing it from Aconite have been already described (p. 144). The volatile oil yielded by horseradish is a *Sulphocyanide of butyl* (C_4H_9CNS); it is allied to that of mustard, and is probably formed in the same way. It is a pale-yellow fluid, heavier than water, readily soluble in alcohol, and slightly in water; applied to the skin, it causes redness and even vesication. Horseradish root also contains a little fat and sugar, but no tannic or gallic acid. With salts of silver or of lead, an aqueous solution of the root gives a black precipitate, indicating the presence in it of sulphur.

POLYGALACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
POLYGALA SENEGA Senega or Snake root (*United States*)	The dried root	Infusum Senegæ	1 oz. to 1 pt.	1 to 2 ozs.	Stimulating expectorant. Used in chronic bronchitis. Said to be also diuretic and an emmenagogue.
		Tinctura Senegæ	2½ ozs. to 1 pt.	½ to 2 drms.	
KRAMERIA TRIANDRIA Rhatany root (*Peru*)	The dried root	Extractum Krameriæ	—	5 to 20 grs.	Astringent. Beneficial in chronic diarrhœa, in mucous discharges generally, and passive hæmorrhages. Locally as a gargle, and applied to prolapsus ani, fissures, etc. Is contained in Pulvis Catechu Co.
		Infusum Krameriæ	1 oz. to 1 pt.	1 to 2 ozs.	
		Tinctura Krameriæ	2½ ozs. to 1 pt.	½ to 2 drms.	

Senega.

A knobby root-stock, with a branched tap-root of about the thickness of a quill, twisted and keeled; the bark is yellowish-brown, with a sweetish pungent taste, causing salivation; odour is somewhat like that of scammony; the interior is woody, tasteless, and inert.

Senega contains a glucoside called *Senegin* or *Polygalic acid*, which is probably identical with *Saponin* ($C_{32}H_{54}O_{18}$), derived from Saponaria officinalis. Saponin, on boiling with dilute acids, breaks up into *Sapogenin* and glucose ($C_{32}H_{54}O_{18} + 2H_2O = C_{14}H_{22}O_2 + 3C_6H_{12}O_6$). It is an acrid white powder, insoluble in cold water and ether, soluble in boiling water and alcohol. It causes sneezing, and is said to cause local anæsthesia when topically applied to the skin.

By the prolonged action of boiling water on senega root, part of the active principle is formed into an insoluble compound with the colouring matter and albumen, hence an infusion is preferable to a decoction of senega.

Besides *Senegin*, senega also contains tannin, pectin, gum, traces of volatile oil, resin, yellow colouring matter, malic acid, and seven per cent. of sugar.

Gillenia and Ginseng, the root of Panax quinquefolium, are used to adulterate senega, but are recognised by the absence of the line or keel running along the true senega root.

Krameria.

The root is about one inch in diameter, branches numerous, long, brownish-red, and rough externally, reddish yellow internally. The rough cortex is strongly astringent, tinging the saliva red; the inner wood is almost tasteless. Rhatany root is almost odourless. It contains *Krameric acid*, which gives a dark-green precipitate with perchloride of iron, said to be *Amidic acid*, and *Rhatanin* ($C_{10}H_{13}NO_3$), homologous with tyrosin. Also about 40 per cent. of tannin, existing chiefly in the rough cortex, and a red astringent matter, both of which are soluble in alcohol and water; it does not contain gallic acid. New Granada or Savanilla rhatany, which is sometimes substituted for the officinal Peruvian or Payta rhatany, is yielded by Krameria Ixina or K. tomentosa, and is perhaps superior medicinally to the officinal variety. Parâ or Brazilian rhatany is also found in commerce. The spurious roots do not possess the characteristic red colour of true rhatany.

LINACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
LINUM USITATISSIMUM Linseed (*Britain*)	The seeds.	Infusum Lini	16 grs. to 1 oz.	*Ad lib.*	Emollient and demulcent in irritation of the pulmonary and genito-urinary systems. Locally emollient.
		Oleum Lini	—	—	
		Lini Farina	—	—	
		Cataplasma Lini	—	—	

Linum.

The seed is small, about a line long, oval, oblong, and flattened, pointed at one end, dark brown and shining on the surface, and white within, odourless, with an oily mucilaginous taste. Oilcake consists of the seeds ground and deprived of their oil by expression ; this reduced to powder constitutes the flour or meal (farina lina—linseed meal). The seeds contain between 20 and 30 per cent. of fixed oil, and about 15 per cent. of mucilage—the oil being found in the kernel and the mucilage in the testa.

The mucilage has the same composition as althæa mucilage ($C_{12}H_{20}O_{10}$) ; it forms with hot water a thick viscid fluid. When mixed with alcohol this throws down white mucilaginous flocks. It gives a precipitate with subacetate of lead, is not affected by infusion of galls or by chlorine, and is not coloured blue by iodine. It reddens litmus, owing to the presence of free acetic acid. Boiling nitric acid converts it into *mucic* and *oxalic acids*, and alkalies convert it into *arabin.*

The oil of linseed is light yellow ; sp. gr. 0·93 ; it has a peculiar taste and odour ; is soluble in alcohol, and more so in ether. It rapidly absorbs oxygen, and forms a varnish; hence is termed a drying oil. It contains *palmitin* and perhaps *stearin*, together with a *glyceride of Lineolic acid* ($C_{16}H_{28}O_2$), the latter in great quantity. Linseed oil becomes blood-red from the production of *Linoxyn* ($C_{32}H_{54}O_{11}$), when acted on by acids and alkalies.

Pure linseed oil is not solidified by nitrate of mercury, as rapeseed oil is.

MALVACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
GOSSYPIUM BARBADENSE Cotton Wool (*United States*)	Hairs of the seeds (carded)	Pyroxylin Collodium Col. Flexile Col. Vesicans	— — — —	— — — —	Protective. Cotton-wool and Collodion are used as a protective to inflamed parts, burns, wounds, etc.

Gossypium.

Consists of fine filaments or tubular hairs, which become flattened and twisted on drying. They have but few joints, which are indicated by lines passing across nearly at right angles to the margins, and, unlike the fibres of linen, they have not tapering ends and are not aggregated in bundles. Cotton-wool resembles *Cellulin* or *Lignin* in composition ($C_{18}H_{30}O_{15}$), and is isomeric with starch, dextrin, etc. It is yellowish-white, tasteless and odourless; completely insoluble in water, alcohol, ether, oils, and vegetable acids. It is dissolved by strong caustic alkaline solutions. Concentrated hydrochloric acid dissolves it; cold sulphuric acid forms with it a treacly-looking liquid, which, when diluted and boiled, is converted into dextrin first and then into glucose; nitric acid converts it into oxalic acid.

Cellulin is not coloured blue with iodine until after digestion in sulphuric acid, and is thus distinguished from starch. The best cotton is said to be yielded by Gossypium barbadense. None of the malvaceous plants are poisonous; most of them contain an emollient mucilage.

AURANTIACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
CITRUS BIGARADIA AND C. AURANTIUM The Seville or Bitter Orange, and the Sweet Orange (*South of Europe*)	*a.* The outer part of the rind of the ripe fruit of the bitter orange	Tinct. Aurantii recentis	3 pts. in 10	1 to 2 drms.	Aromatic, bitter, stomachic, and flavouring agent.
		Vinum Aurantii	—	—	Ibid. Used in making Vin. Ferri Citratis, and Vin. Quininæ.
	b. The dried outer part of the rind of the bitter orange	Inf. Aurantii	1 oz. to 1 pt.	5 to 2 ozs.	Same as that of the tincture, as above.
		Inf. Aurantii Co.	½ oz. to 1 pt.	1 to 2 ozs.	
		Tinct. Aurantii	2 ozs. to 1 pt.	1 to 2 drms.	
		Syrup. Aurant.	1 Tinct. in 8	1 drm.	
	c. Flowers of the bitter and of the sweet orange tree	Aqua Aurantii Floris	—	1 to 2 ozs.	Flavouring agent.
		Syrup. Aurantii Floris	—	1 drm.	Ibid.
CITRUS LIMONUM The Lemon (*Southern Europe*)	*a.* The ripe fruit	Succus Limonis,	—	—	Refrigerant and antiscorbutic. The oil externally is rubefacient, and contained in Sp. Ammoniæ Aromat. and in Lin. Potass. Iodid. c. Sapone. Preps. chiefly used for flavouring.
		Syrup. Limon.	1 pt. to 3½ lbs.	1 drm.	
	b. The outer part of the rind of the fresh fruit	Oleum Limonis	—	—	
		Syrupus Limonis	1 oz. to 1¾ lbs.	1 drm.	
		Tinctura Limonis	2½ ozs. to 1 pt.	1 to 2 drms.	
ÆGLE MARMELOS Bael Fruit (*Malabar and Coromandel*)	Dried half-ripe fruit	Extractum Belæ Liquidum	1 oz. to 1 oz.	1 to 2 drms.	Astringent. Used in diarrhœa and dysentery.

Aurantii Cortex.

The fruit of the orange is an hesperidium; the rind is thin, of a dark-orange colour, and should be nearly free from the white inner part. It is studded with oil-vesicles, which are concave in the bitter orange and convex in the sweet. The small unripe fruits called orange-berries are used for flavouring curaçoa. The flowers of the bitter orange are large, white, and fragrant; those of the sweet orange are yellowish and not so fragrant. Orange-peel has an aromatic bitter taste and agreeable odour; it contains a volatile oil isomeric with that of turpentine ($C_{10}H_{16}$); a bitter extractive named *Hesperidin* or *Aurantiin;* a glucoside probably identical with *Limonin*, and a little gallic acid. The orange flower contains a little volatile oil (oil of Neroli), differing from that contained in the rind.

Limonis Cortex et Succus.

The fruit is an hesperidium; the rind should have the interior white portion removed; it is lighter in colour than that of orange, and like it is dotted with numerous convex oil-vesicles; it has a fragrant odour and an aromatic slightly bitter taste; a watery infusion of it becomes greenish on the addition of perchloride of iron.

The volatile oil is expressed or distilled; it is pale yellow; that obtained by the latter process is purer but less pleasant in flavour; its sp. gr. is 0·85; it is isomeric with oil of turpentine, oil of orange, etc. ($C_{10}H_{16}$). These oils yield a crystalline substance when saturated with hydrochloric acid gas; that yielded by oil of lemon contains two molecules of the acid, that yielded by oil of turpentine contains but one. Like most volatile oils, oil of lemon is composed of two isomeric oils, *Citrene* and *Citrylene.* After long keeping it deposits a crystalline fat. Besides the oil the rind of the lemon contains *Hesperidin* or *Aurantiin; Limonin* obtained from the seeds is probably identical. The presence of

Hesperidin in the white portion of the rind is indicated by the development of a yellow colour on moistening it with ammonia. The rind also contains a little gallic acid.

The juice of the lemon is a slightly turbid yellowish liquor, with a sharp acid taste and grateful odour. Its average sp. gr. is 1·039. The quantity of citric acid contained in it is about 32·5 grains to the fluid ounce, but the proportion varies with the age of the fruit; it also contains mucilage, malic and phosphoric acids in small quantity, acid salts, especially those of potash, sugar, etc. To preserve the juice, it may be heated to 150°, filtered and kept in completely-filled bottles, or one-tenth part of brandy may be added.

Belæ Fructus.

The fruit is roundish, about the size of a large orange, with a hard woody rind; it is usually imported in dried slices, or in fragments consisting of parts of the rind and adherent dried pulp and seeds. The rind is about a line and a half thick, is covered with a smooth pale-brown or grayish epidermis, and internally, as well as the dried pulp, is brownish orange or cherry-red. The moistened pulp is mucilaginous. The ripe fruit is refrigerant. The pulp and seed-coats yield a large quantity of mucilage, some sugar, and a trace of an astringent principle probably allied to tannic acid.

Mangosteen fruit has been substituted for bael fruit, but it is thicker, does not contain the adhering pulp and seeds, and it presents pieces of dark, radiating, wedge-shaped stigmas.

STERENLIACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
THEOBROMA CACAO Cacao Butter (*West Indies and South America*)	Concrete oil from the seeds	—	—	—	Used for making suppositories of Acidum Tannic., Hydrarg., Morphina, and Plumbi Co.

Oleum Theobromatis.

This and the expressed oil of nutmeg are the only two solid vegetable fats. Oil of theobroma is obtained from the ground seeds by expression and heat; it has the consistency of tallow, is of a yellowish colour; its odour resembles that of chocolate, and its taste is bland and agreeable; its fracture is clean, presenting no appearance of foreign matter; it does not become rancid on exposure to air. It melts at about 95°; it is insoluble in water, but soluble in alcohol, ether, and oil of turpentine. It is composed chiefly of stearin with a little oleine. The seeds contain an alkaloid, *Theobromine* ($C_7H_8N_4O_2$), which resembles *Caffeine* or *Theine* chemically and physiologically. It is slightly bitter, sparingly soluble in boiling water, and even less soluble in alcohol and ether.

SAPINDACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
GUARANA Brazilian Cocoa (*Brazil*)	Dried paste of powdered seeds	—	—	15 to 30 grs.	Stimulant like tea. Is given for migraine, also for diarrhœa and dysentery.

Guarana (*not official*).

The dried seeds, after being slightly roasted, are powdered and made into a stiff paste with water. With this paste a certain proportion of the whole and broken seed is mingled. The mass is then moulded into cylindrical rolls not unlike sausages; colour dark reddish-brown; fracture uneven, showing fragments of seeds with a black outer covering. Guarana has a slight odour something like chocolate, and a bitter astringent taste; it is partly soluble in water and alcohol. It contains *guaranine* or *caffeine*, of which it contains about

5 per cent., a larger proportion than is contained in either tea or coffee. Tannic acid, starch, and gum are also present.

ERYTHROXYLACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
ERYTHROXYLON COCA Coca or Cuca (*Bolivia and Peru*)	The dried leaves	Extractum Cocæ Liquidum	1 pt. in 1	½ to 2 drms.	Restorative stimulant and narcotic. The alkaloid possesses anæsthetic properties when applied to a mucous surface.
		Cocainæ Hydrochloras		⅕ to 1 gr.	
		Lamella Cocainæ	$\frac{1}{200}$ gr. each		

Coca.

The leaves have short stalks, and are oval or lanceolate, entire, usually blunt and emarginate, 1 to 2 inches in length, midrib is prominent, with a curved line on each side of it, extending from base to apex. Green above, somewhat paler beneath. They have a faint, tea-like odour, especially when bruised. They contain about ½ per cent. of an alkaloid *cocaine*, in combination with a variety of tannic acid.

Hydrochlorate of Cocaine consists of colourless acicular crystals or crystalline powder, readily soluble in water, alcohol, and ether. Its solution in water has a bitter taste, and gives a yellow precipitate with chloride of gold, and a white precipitate with carbonate of ammonium, soluble in excess. Heated with strong hydrochloric acid it is resolved into *ecgonine*, together with benzoic acid and methyl alcohol. In cold concentrated acids hydrochlorate of cocaine dissolves without colour, but it chars with hot sulphuric acid. The solution yields little or no cloudiness with chloride of barium or oxalate of ammonium.

CAMELLIACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
CAMELLIA THEA Tea (*China and India*)	The dried leaves	Caffeina	—	1 to 5 grs.	In large doses the alkaloid produces loss of sensibility, convulsions and death. It increases the heart's action and raises the blood pressure. Is given as a diuretic, and also in headache, neuralgia, etc.
COFFEA ARABICA Coffee (*Throughout the Tropics*) (N. O. Cinchonaceæ)	The berries	Caffeinæ Citras	—	2 to 10 grs.	

Caffeine.

This alkaloid is usually obtained from the dried leaves of *Camellia Thea*, the common tea plant, or from the dried seeds of *Coffea Arabica*, the coffee berry; but it is also present in large quantity in Guarana and Maté (Paraguay tea). It is obtained by evaporating aqueous infusions of one or the other of these substances, from which astringent and colouring matters have been removed. It occurs in colourless, silky, acicular crystals, without smell but with a bitter taste. Soluble in eighty parts of cold water, the solution being neutral to litmus. More soluble in boiling water and rectified spirit, and extremely so in chloroform. At 212° F. the crystals lose 8·49 per cent. of their weight from evaporation of water of crystallisation, and at a higher temperature melt and volatilise without decomposition. Treated with a crystal of chlorate of potassium and a few drops of hydrochloric acid, the mixture, when evaporated to dryness in a porcelain dish, leaves a residue of a reddish colour, becoming purple on the addition of ammonia.

Caffeinæ Citras.

Is a white inodorous powder with an acid and faintly bitter taste. It is soluble in a mixture of two parts of chloroform and one part of rectified spirit. With a little water it forms a clear syrupy solution which on dilution yields a white precipitate of caffeine, which redissolves when ten parts of water have been added. Tannic acid yields a white precipitate soluble in excess.

GUTTIFERÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
GARCINIA HANBURII Gamboge (*Siam*)	Gum-resin	Pulv. Cambogiæ Pil. Cambog. Co.	— 1 pt. in 6	1 to 4 grs. 5 to 10 grs.	Drastric purgative. Given in dropsies and in cerebral disease.

Cambogia.

Occurs in pipes or cylindrical pieces, an inferior variety called cake or lump gamboge being met with in irregular masses. Gamboge is procured by making incisions into the stem, or by cutting away some of the bark and scraping away the juice which exudes; the Siam or pipe gamboge is streaked externally from the impressions of the bamboo reeds in which the juice is collected. Gamboge breaks easily with a smooth conchoidal glistening fracture; colour is tawny, changing to yellow when it is rubbed with water; it is odourless, but the powder causes sneezing and a flow of mucus; it has an acrid taste. An emulsion made with boiling water and cooled does not become green with solution of iodine, showing the absence of starch.

Gamboge consists of about between 75 to 80 per cent. of a yellow resin having acid properties, *Gambogic acid* ($C_{20}H_{23}O_4$), with about 20 to 25 per cent. of a soluble *gum*. The resin which is obtained by evaporating to dryness the ethereal tincture of the gum-resin is soluble in alcohol and ether, and is precipitated from these solutions by water; it is also soluble in solution of potash, forming a deep red liquid gambogiate of potassium. This gives with solution of acetate of lead a yellow precipitate of gambogiate of lead, and with solution of sulphate of copper, a brown precipitate of gambogiate of copper; the addition of an acid to it precipitates the resin. When rubbed with water, the gum of gamboge dissolves, forming a yellow emulsion with the suspended resin.

The Ceylon variety of gamboge, which is not officinal, is derived from the Hebradendron gambogioides.

CANELLACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
CANELLA ALBA Laurel-leaved Canella (*West Indies*)	Bark	—	—	—	Aromatic, bitter, stomachic tonic. An ingredient of Vinum Rhei.

Canella Alba.

Is met with in quills, or broken flattened pieces about an inch or so in diameter, and of varying length; these are hard and break with a granular fracture. They are of a very pale yellowish colour, and are somewhat lighter on the internal surface. Canella bark has an aromatic clove-like odour and an acrid peppery taste. It contains a resin, a little volatile oil which resembles cajeput, and oil of cloves, in some of its physical and chemical characters; it also contains some bitter extractive besides starch and mannite. It does not contain tannic or gallic acids, and is thus distinguished from Winter's bark (*Drimys Winteri*, N.O. Magnoliaceæ), for which it is sometimes sold; the inner surface of the latter bark is also dark-coloured.

VITACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
VITIS VINIFERA The Grape Vine (*Spain*)	The ripe fruit dried	—	—	—	Used to flavour and sweeten Tinct. Cardamon. Co., and Tinct. Sennæ.

Uvæ.

Raisins contain a considerable amount of grape-sugar ($C_6H_{12}O_6$), acid tartrate of potassium, and malic acid. Tartaric acid is derived from the grape, being obtained from "Argol," the deposit on the insides of wine casks. The seeds yield from 15 to 18 per cent. of a tasteless fixed oil, and about the same quantity of tannic acid, which, together with some colouring matter, is also yielded by the skin. "Sultana raisins" are stoneless. Corinthian raisins or "currants" are the produce of a small-sized grape abundant in the Ionian Islands.

ZYGOPHYLLACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
GUAIACUM OFFICINALE Guaiacum wood (*St. Domingo and Jamaica*)	*a.* The wood	—	—	—	Diaphoretic, alterative, stimulant, and emmenagogue. Given in chronic rheumatism, quinsy, amenorrhœa, etc. The wood is contained in the Decoct. Sarsæ Co. and resin in the Pil. Hydrarg. Subchlor. Co.
	b. The resin	Pulv. Guaiaci	—	10 to 30 grs.	
		Mist. Guaiaci	1 pt. in 40	½ to 2 ozs.	
		Tinct. Guaiaci Ammoniata	1 pt. in 5	½ to 1 drm.	

Guaiacum.

Guaiacum wood (*lignum vitæ*) occurs in the form of a coarse powder or chips; it is also met with in the form of large logs, generally denuded of bark and consisting of an outer layer of alburnum or young sap-wood, which is of a pale-yellow colour, the inner portion, the duramen or heart-wood, being of a dark greenish-brown. It is very hard, tough, and heavy, its sp. gr. being 1·33, so that it sinks readily in water. The fibres intersect diagonally and obliquely, giving it a remarkable cross-grained appearance. The powder of guaiacum wood when slightly heated with solution of corrosive sublimate, or when treated with nitric acid, is turned bluish-green; solution of chloride of lime also turns it green.

The resin constitutes 26 per cent. of the wood, and is obtained from the stem by natural exudation (tears), by incisions, or by heat. It occurs in large masses, which are olive-brown when recent, but which become brown on exposure to air. It has an aromatic odour and is tasteless at first, but leaves a burning sensation in the throat. Its fractured surface is resinous and translucent at the edges; its sp. gr. is 1·25; it is insoluble in water, but soluble in alcohol, ether, and alkaline solutions. A solution in rectified spirit strikes a clear blue colour when applied to the cut surface of a raw potato, due to the action of Guaiacic acid on the gluten. It is precipitated from alcohol by water and from alkalies by acids. Acted on by nitric acid and chlorine it yields a green colour, which soon becomes green and finally brown. Guaiacum resin contains *Guaiacic acid* ($C_6H_8O_3$), about 10 per cent. of Guaiaretic or Guaiaretinic acid ($C_{20}H_{26}O_4$), and about 70 per cent. of *Guaiaconic acid* ($C_{19}H_{20}O_5$), with other vegetable matter. The resin being mostly acid combines with alkalies as in the ammoniated tincture; it undergoes peculiar changes by oxidation with different re-agents.

Guaiacum resin is sometimes adulterated with resins of conifers; these may be detected by their terebinthinate odour and solubility in oil of turpentine. Simple tincture of guaiaum resin becomes milky when added to water, but becomes lear on carefully adding solution of potash in excess, if other esins be not present.

The resin of scammony and jalap are sometimes adulterated ith guaiacum.

RUTACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
BAROSMA BETULINA, B. CRENULATA, B. SERRATIFOLIA Buchu (*Cape of Good Hope*)	Dried leaves	Infusum Buchu Tinctura Buchu	1 oz. to 1 pnt. $2\frac{1}{2}$ ozs. to 1 pnt.	1 to 4 ozs. 1 to 2 drms.	Stimulating diuretic, sedative to genito-urinary mucous membrane. Beneficial in catarrh of bladder, lithiasis.
GALIPEA CUSPARIA Cusparia or Angustura (*South America*)	Bark	Infusum Cuspariæ	1 oz. to 1 pnt.	1 to 2 ozs.	Aromatic bitter stomachic and tonic. Used in dyspepsia, debility.
RUTA GRAVEOLENS Common or Garden Rue (*South of Europe*)	Fresh herb	Oleum Rutæ	—	1 to 4 mins.	Locally irritant. Used internally as a carminative and emmenagogue.
PILOCARPUS PINNATIFOLIUS Jaborandi (*Pernambuco*)	The dried leaflets	Extractum Jaborandi Infusum Jaborandi Tinctura Jaborandi Pilocarpinæ Nitras	— 1 pt. in 20 1 pt. in 4 —	2 to 10 grs. 1 to 2 ozs. 30 to 60 mins. $\frac{1}{20}$ to $\frac{1}{2}$ gr.	It is a powerful diaphoretic and sialogogue. In large doses it causes vomiting. It is antagonistic to belladonna. It is given in coryzal colds, for dropsy, especially of chronic Bright's disease, and for uræmia.

Buchu.

The leaves of buchu are light-yellowish or grayish-green, smooth, and marked with pellucid dots or oil-glands, chiefly at the indentations and apex; they have a powerful odour and a warm, camphoraceous taste.

The leaves of Barosma betulina (short buchu) are about three-quarters of an inch long, coriaceous, obovate, with a recurved truncated apex, and sharp, cartilaginous, spreading teeth. The leaves of Barosma crenulata (medium buchu) are about an inch long, oval-lanceolate, obtuse, minutely crenulated, and five-nerved. The leaves of Barosma serratifolia (long buchu) vary in length from an inch to an inch and a half, are linear-lanceolate, tapering at each end, sharply and finely serrated, and three-nerved.

Buchu, particularly B. betulina, contains about 1½ per cent. of a light brownish-yellow volatile oil, which gives the odour to the leaves; at a low temperature this deposits a small quantity of a crystalline barosma-camphor. Buchu leaves also contain a bitter extractive matter, *Barosmin* or *Diosmin*, which is soluble in water, but insoluble in alcohol or ether. With an aqueous infusion of the leaves, perchloride of iron gives a brownish-green colour, and acetates of lead and copper throw down a yellow precipitate. The leaves of another rutaceous plant, Empleurum serrulatum, have been substituted for B. serratifolia; but they are narrower, terminate in an acute point without a gland, have a bitter taste, and are of a different odour.

Cusparia.

Cusparia bark occurs in straight pieces, more or less incurved at the sides, from half a line to a line thick, and pared away at the edges. The epidermis is mottled brown or yellowish-gray. The inner surface is yellowish-brown and flaky. It breaks with a short fracture; has a peculiar odour, and a bitter, slightly aromatic taste. The cut surface, examined with a lens, usually exhibits numerous white points or minute lines which are raphides of oxalate of lime and liber-fibres.

The inner surface of the bark does not become blood-red, but is turned bluish-black when touched with nitric acid. Nitric acid applied to the epidermal surface may render it slightly orange-red.

Cusparia contains a trace of volatile oil, some resin, and a neutral bitter principle, *Cusparin* or *Angusturin.* Its composition is not known, but it is obtained in tetrahedral prisms, and is soluble in alcohol, acids, and alkalies. Infusion of cusparia is precipitated by tannin.

The bark of Strychnos nux vomica has been substituted for cusparia bark, and is hence named "false, or East-Indian, angustura bark." This latter is usually in shorter pieces, is more irregularly twisted, is almost odourless, has a much more bitter taste, breaks with a shorter fracture, is not separable into layers; has a whitish epidermis, which is spotted red and is turned greenish or black by nitric acid. Nitric acid applied to the inner surface of the false bark turns it blood-red, owing to the presence of *Brucia. Strychnine* is also an ingredient of the false bark.

Rue.

Oil of rue is obtained by distillation with water from the fresh herb. It is of a pale yellow colour, becoming brown by age, of a disagreeable odour, and has a bitter, acrid taste. Its sp. gr. is 0·837. It contains a terpene ($C_{10}H_{16}$) with some rutic aldehyd ($C_{10}H_{20}O$). It has been obtained also artificially.

Jaborandi.

The leaves are compound, pinnate, with three to five pairs of leaflets and a terminal one. The leaflets are usually from four to six inches in length, oval oblong, or oblong lanceolate, somewhat unequal at the base, obtuse, emarginate, and coriaceous. Upper surface smooth, under surface paler, often somewhat hairy, with prominent midrib and full of pellucid dots. They have a slightly aromatic odour when bruised, their taste is at first bitter and aromatic, subsequently hot, pungent, and increasing the flow of saliva. They contain a liquid alkaloid, *Pilocarpine*, which is colourless and odourless. The leaves also contain *Jaborine.*

Nitrate of Pilocarpine occurs as a white crystalline powder or acicular crystals; soluble in eight or nine parts of water, slightly so in cold, and freely in hot rectified spirit. With strong sulphuric acid it yields a yellowish solution which gradually acquires an emerald-green colour on the addition of bichromate of potassium. It contracts the pupil.

SIMARUBACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
PICRÆNA EXCELSA Quassia (*Jamaica*)	Wood	Extract. Quassiæ	—	3 to 5 grs.	Bitter stomachic, tonic; beneficial in dyspepsia.
		Infusum Quassiæ	6 grs. to 1 oz.	1 to 2 ozs.	
		Tinctura Quassiæ	16½ grs. to 1 oz.	½ to 2 drms.	

Quassia.

Billets of variable size, seldom thicker than the thigh. The wood is dense, tough, whitish, becoming yellow on exposure; externally it is greyish-brown, and an efflorescence of nitrate of potash is not infrequently found upon it; it is odourless, but has an intensely and purely bitter taste. It is generally sold in chips or raspings.

Quassia yields its bitterness to spirit and to water, but it is curious that the bitterness of the aqueous infusion is immediately removed by permanganate of potassium. Quassia contains a neutral crystallisable principle, *Quassine* ($C_{10}H_{12}O_3$); this is readily soluble in alcohol, but slightly so in ether or water, and its solution in the latter menstruum is increased by several salts and vegetable principles. It is devoid of tannic and gallic acids, and hence may be combined with salts of iron.

Surinam bitter-wood is derived from Quassia amara, the original source of quassia.

RHAMNACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
RHAMNUS FRANGULA Frangula bark (*Europe*)	The dried bark	Extractum Rhamni Frangulæ	—	15 to 60 grs.	Is used as a purgative in chronic constipation.
		Extractum Rhamni Frangulæ Liquidum	—	1 to 4 drms.	
RHAMNUS PURSHIANUS Cascara Sagrada (*North America*)	The dried bark	Extractum Cascaræ Sagradæ	—	2 to 8 grs.	It possesses tonic purgative properties and is used in the treatment of chronic constipation.
		Extractum Cascaræ Sagradæ Liquidum	—	½ to 2 drms.	

Rhamnus Frangula.

The bark is in small quills about $\frac{1}{25}$ of an inch thick, covered with a greyish-brown or blackish-brown corky layer, with white transverse markings; the inner surface is smooth and brownish-yellow in colour; fracture short externally, somewhat fibrous within. It has a pleasant sweetish but rather bitter taste. Its most important constituent is *Frangulin.*

Cascara Sagrada.

In quills $\frac{1}{25}$ to $\frac{1}{8}$ of an inch thick, or in curved pieces of varying lengths and sizes, covered externally with a greyish-white layer, which is usually easily removed, and frequently marked with spots or patches of adherent lichens. Internally reddish-brown or yellowish-brown. Fracture short, except internally. Taste bitter, no marked odour. Probably its active principle is similar to that of Rhamnus frangula.

ANACARDIACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
Pistacia Lentiscus Mastich (*Levant*)	Resinous exudation.	—	—	—	Stopping for teeth. Masticatory.

Mastiche.

Mastich is a true resin, and is obtained by making incisions into the stem, when it exudes. It occurs as small, irregular, yellowish tears, which are often covered with a whitish dust; they are brittle, breaking with a vitreous, shining, transparent fracture; they become soft and ductile when chewed; their odour is faint but agreeable. Mastich is wholly soluble in ether or chloroform, but almost insoluble in fixed oils. It consists of *Mastichic acid* ($C_{20}H_{30}O_2$), which is soluble in alcohol, and *Masticin* ($C_{20}H_{31}O$), which is dissolved by ether.

AMYRIDACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
Balsamodendron Myrrha Myrrh (*Arabia and Abyssinia*)	Gum - resin exuding from stem	Tinctura Myrrhæ	54½ grs. to 1 oz.	½ to 1 drm.	Stimulant. Tonic and mild astringent. Contained in Decoct. Aloes Co., Mist. Ferri Co., Pil. Aloes et Myrrh., Pil. Assafœtid. Co., and Pil. Rhei. Co.
Canarium Commune Elemi (*Manilla*)	Resinous exudation	Unguent. Elemi	1 pt. in 5	—	Topical stimulant to indolent sores and boils.

Myrrha.

Myrrh of the best quality, the so-called Turkey myrrh, is in irregular tears or masses of variable size, somewhat translucent but occasionally covered with powder; it is of a reddish-yellow or reddish-brown colour; the fractured surface is irregular and somewhat oily. Myrrh has an agreeable aromatic odour and an acrid bitter taste. The inferior varieties of myrrh are in large masses, darker in colour and less translucent. Myrrh is now exclusively imported from the East Indies.

Myrrh contains a volatile oil (*Myrrhol*), gum, resin, (*Myrrhin*), and certain salts. The volatile oil is at first colourless, but becomes yellowish on keeping. The gum differs but little from *Arabin;* its solution in water is precipitated by alcohol, salts of lead, silver, protosalts of tin and of mercury. The resin of myrrh is bitter, is soluble in caustics, in alcohol, and partly soluble in ether; moistened with alcohol and then with hydrochloric acid, it assumes a violet hue which is less brilliant than that assumed by galbanum when similarly treated. Nitric acid dropped on a fragment of myrrh, or on a concentrated tincture, develops a red colour.

With water myrrh forms a milky-white emulsion from the suspension of the resin by the gum which is held in solution. Myrrh is inflammable; it softens but does not melt on heating. Other gum resins, especially gum-bdellium or "false myrrh," probably derived from other species of Balsamodendron, are sometimes met with in samples of myrrh.

Elemi.

A soft unctuous adhesive mass, becoming harder and more resinous by age; is yellowish-white with a rather fragrant fennel-like odour, which is due to the presence of from 10 to 12 per cent. of volatile oil. Elemi is almost entirely soluble in rectified spirit. A crystalline resin, *Elemin* or *Amyrin*, is present in the proportion of 25 per cent.; an uncrystallisable resin in the proportion of about 60 per cent. is also present. Besides these, Elemi contains from 1 to 2 per cent. of *Bryoidin* and *Breidine*, crystalline, bitter, neutral principles, which are feebly soluble in cold water, but freely soluble in hot water, in alcohol, and ether.

Elemi is known from olibanum and other resins by its crystalline structure, which is revealed by the microscope; on treating the elemi with cold alcohol a white residuum is formed, consisting of acicular crystals of *Amyrin*.

LEGUMINOSÆ.

Papilionaceæ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
Glycyrrhiza Glabra Liquorice (*England*)	Rhizome	Extract. Glycyr.	—	—	Demulcent. The compound powder is purgative. In coughs. Contained in several preparations on account of its sweetening and flavouring properties.
		Extract. Liquid.	—	1 drm.	
		Pulv. Glycyr. Co.	—	30 to 60 grs.	
Astragalus Gummifer Tragacanth (*Asia Minor*)	Gummy exudation from stem	Mucilago Tragacanthæ	60 grs. to 10 ozs.	—	Demulcent. Used to suspend heavy powders. In Conf. Opii and Pulv. Opii Co.
		Pulvis Co.	1 pt. in 6	20 to 60 grs.	
		Glycerinum Tragacanth	—	—	
Cytisus Scoparius Common Broom (*Europe*)	Fresh and dried tops	Decoctum Scoparii	1 oz. to 1 pnt.	2 to 4 oz.	Diuretic.
		Succus Scoparii	3 pts. to 1 spt.	1 to 2 drms.	Ibid.
Pterocarpus Santalinus Red Sandal-wood (*Coromandel and Ceylon*)	Wood	—	—	—	Used only for colouring Tinc. Lavand. Co.

LEGUMINOSÆ (*continued*).

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
PTEROCARPUS MARSUPIUM Kino (*Malabar*)	Inspissated juice exuding from incisions in the stem	Pulvis Kino	—	10 to 30 grs.	General and local astringent in diarrhœa, dysentery, relaxed sore throat, etc. Contained in Pulv. Catechu Co.
		Pulvis Kino Co.	$3\frac{3}{4}$ pt. in 5	5 to 20 grs.	
			1 gr. in 20 of Opium	—	
		Tinctura Kino	2 ozs. to 1 pnt.	$\frac{1}{2}$ to 2 drms.	
MYROXYLON PEREIRÆ Balsam of Peru (*Salvador*)	Balsam exuding from the stem after removal of the bark	Balsam. Peru.	—	10 to 15 mins.	Stimulant, expectorant. Locally a stimulant, and applied to bedsores, ulcers, etc. Given in chronic rheumatism, chronic bronchitis. In gleet, leucorrhœa, etc.
MYROXYLON TOLUIFERA Balsam of Tolu (*New Granada*)	Balsam exuding from incisions in the bark	Syrupus Tolu	$1\frac{1}{4}$ oz. to 3 pds.	1 drm.	Stimulant, expectorant. Similar to Balsam of Peru. Contained in Tinct. Benzoin. Co.
		Tinctura Tolu	$58\frac{1}{2}$ grs. to 1 oz.	20 to 40 mins.	
PHYSOSTIGMA VENENOSUM Calabar Bean (*West Africa*)	The seed	Pulv. Physostig.	—	1 to 4 grs.	Contracts pupil; paralyses spinal cord; depresses heart. Employed in chorea, tetanus, general paralysis of the insane, and, locally, to contract pupil.
		Extractum Physostigmatis	—	$\frac{1}{16}$ to $\frac{1}{4}$ gr.	
		Physostigmina	—	—	
		Lamella Physostigminæ	$\frac{1}{1000}$ gr. each	—	
HÆMATOXYLON CAMPECHIANUM Logwood (*West Indies*)	Wood	Decoctum	1 oz. to 1 pnt.	1 to 2 ozs.	Astringent in diarrhœa, dysentery.
		Extractum	—	10 to 30 grs.	
CASSIA ACUTIFOLIA Alexandrian Senna CASSIA ANGUSTIFOLIA Tinnivelly or Indian Senna	Leaflets	Confectio Sennæ	1 pt. in 11 nearly	60 to 120 grs.	Purgative. Contained in Pulv. Glycyrr. Co.
		Infusum Sennæ	2 ozs. to 1 pnt.	1 to 2 ozs.	
		Mist. Sennæ Co.	—	1 to $1\frac{1}{2}$ ozs.	
		Syrupus Sennæ	1 to 2 ozs.	1 to 4 drms.	
		Tinctura Sennæ	$2\frac{1}{2}$ ozs. to 1 pnt.	1 to 4 drms.	

LEGUMINOSÆ (*continued*).

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
CASSIA FISTULA Purging Cassia (*East and West India*)	Pulp of the pods	—	—	—	Laxative. Contained in Confect. Sennæ.
TAMARINDUS INDICA Tamarind (*East and West India*)	Pulp of the fruit	—	—	—	Refrigerant, laxative. Contained in Conf. Sennæ.
COPAIFERA LANGSDORFFII Balsam of Copaiva (*West Indies and Valley of Amazon*)	Oleo-resin from incised trunk	Copaiba Oleum Copaibæ	— —	$\frac{1}{2}$ to 1 drm. 50 to 20 mins.	Stimulant to mucous membranes. Diuretic. Given in gonorrhœa, cystitis, bronchitis, and dropsy.
ACACIA Gum Arabic (*Eastern Africa*)	Gummy exudation from stem	Mucilago Acaciæ	1 in $2\frac{1}{2}$	*Ad lib.*	Demulcent. Used to suspend powders and to emulsify oils or resinous tinctures. An ingredient of Mist. Cretæ, Mist. Guaiaci, Pulvis Amygd. Co., Pulv. Tragacanth. Co., and all Trochisci.
INDIGOFERA Indigo (*India*)	The plants fermented	Sol. of Sulphate of Indigo (App. III.)	—	—	Test for free chlorine.
ANDIRA ARAROBA Chrysarobinum Goa Powder (*India*)	Medullary part of stem and branches	Unguentum Chrysarobini	20 grs. to 1 oz.	$\frac{1}{6}$ to $\frac{1}{2}$ gr.	Is used as an application for psoriasis, etc.; also internally for same purposes.

Glycyrrhizæ Radix.

In long cylindrical branched pieces, an inch or less in diameter, tough and pliable; of a greyish-brown colour externally, yellow internally, odourless, with a sweet mucilaginous but slightly acrid taste. Digested with water it yields a solution which gives a precipitate with dilute sulphuric acid.

Liquorice root contains, like several other leguminous rhizomes, a peculiar sweet substance, *Glycyrrhizine* or "liquorice sugar" ($C_{24}H_{36}O_9$); this is yellow, transparent, amorphous, and nonfermentable; is soluble in spirit and in water, and is precipitated from its aqueous solution by dilute acids; when boiled with hydrochloric acid it is resolved into *Glycyrrhetin*, a bitter resinous matter, and glucose. Liquorice also contains *Asparagine*, gum, mucilage, etc. Heat dissolves out the acrid resinous oil, hence the extract is made with cold water. Liquorice powder is often adulterated on the Continent with a yellow pigment named "French yellow;" this is detected by its effervescing on the addition of hydrochloric acid.

Tragacantha.

This, which is commonly called Gum Dragon, is not the true secretion of the plant, but appears to be the result of a transformation of the cells of the pith and medullary rays. The flaky or Smyrna variety is white or yellowish, occurs in broad shell-like slightly curved plates. Vermiform or Morea tragacanth is rarely met with in this country, but is common on the Continent; it occurs in small twisted filiform spiral pieces. Tragacanth is tough and elastic, but is rendered more pulverisable by a heat of 120° F., at which temperature it loses about 14 per cent. of water; it is almost tasteless; specific gravity is 1·384; is very sparingly soluble in cold water, but swells up into a gelatinous mass which is tinged violet by tincture of iodine. After maceration in cold water the fluid portion is not precipitated by the addition of rectified spirit, showing the absence of gum-acacia.

Tragacanth is usually considered to be a mixture of about 53 per cent. of *Arabin* or *Tragacanthin* and about 33 per cent. of *Bassorin*, together with a little starch. *Tragacanthin* is a soluble gum, and a solution filtered from the insoluble gum

Bassorin is precipitated by normal acetate of lead, but is not rendered turbid by perchloride of iron, borax, or silicate of potassium. *Bassorin*, the insoluble gum, unlike *Arabin*, is devoid of acid properties.

By the action of alkalies and by the prolonged action of boiling water, tragacanth is rendered soluble in water and is converted into true gum. Nitric acid converts it into mucic and oxalic acids, and prolonged boiling with dilute sulphuric acid into sugar.

Tragacanth collected in Asia Minor is frequently mixed with two other gums—Caramania and Moussal gum.

Scoparii Cacumina.

Straight, pentangular, dark-green, smooth, tough twigs, with small oblong leaves, of a bitter nauseous taste, and of a peculiar odour when bruised, but which is lost in drying. They contain a neutral principle, *Scoparine* ($C_{21}H_{22}O_{10}$), on which the diuretic properties of broom depend, and *Spartein* ($C_{15}H_{26}N_2$), a volatile liquid alkaloid which is narcotic, besides extractive matters and salts. *Scoparine* is pale yellow, amorphous, tasteless, odourless, and soluble in alcohol and water. *Spartein*, which is obtained by distillation, is a viscid oil, pale when fresh, but becoming brown on exposure; it forms crystalline salts with perchloride of platinum and corrosive sublimate.

Pterocarpi Lignum.

Dense heavy billets, outwardly dark brown, internally variegated with dark and light red rings if cut transversely. Powder is blood-red. Red sandal-wood also occurs in chips; it has a faint, peculiar, violet-like odour, particularly when rubbed, and it has a slightly astringent taste. Sandal-wood contains a dark-red crystalline principle, *Santalin* or *Santalic acid* ($C_{15}H_{14}O_5$); it also contains *Santal* ($C_8H_6O_3$), which separates from boiling alcohol in colourless, tasteless crystals;

a small quantity of *Kino-tannic acid* is also present. The colour of the wood is extracted by alcohol, ether, acetic acid, and alkaline solutions, but not by water; the only volatile oils which dissolve it are those of lavender and rosemary. An infusion of the wood in cold distilled water is of a pale sherry colour, and exhibits a dark blue fluorescence which is destroyed on boiling, the infusion becoming pale red. The colour of the wood is due to the gradual oxidation of an originally colourless principle.

Acids precipitate the *Santalin*, and solutions of metallic salts throw down red or violet precipitates, and are hence incompatible with sandal-wood.

Kino.

Several substances were formerly known under the name of "kino." Thus, there was West Indian or Jamaica kino, South American kino, Butea gum, African kino, Botany Bay kino, etc. The officinal kino is the East Indian or Amboyna kino. It occurs in small, angular, brittle, glistening, reddish-black fragments, translucent and ruby-red on the edges; inodorous, very astringent, tinging the saliva blood-red when chewed. It burns with little flame; is soluble in water and spirit. The aqueous solution gives an intense violet colour when agitated with a little reduced iron or a neutral solution of ferrous sulphate. It is decolourised by acids, and the colour is restored by alkalies.

Besides about 24 per cent. of red gummy matter, kino contains about 75 per cent. of a species of *tannin* called *Mimotannic*, or *Kino-tannic*, or *Catechu-tannic acid* ($C_{18}H_{18}O_8$), and another astringent principle, which is also found in catechu, *Catechin* ($C_{20}H_{18}O_8$).

Alkalies increase the solubility of kino in water, but they destroy its astringency. Solutions of kino precipitate iron salts of a green colour; hence these, as well as salts of lead, silver, mercury, antimony, and the mineral acids, are incompatible with kino. Gelatine also gives with solution of kino a greenish precipitate.

Balsamum Peruvianum.

This is a true balsam; that is, a fragrant resinous substance containing either benzoic or cinnamic acid. The other true balsams are Balsam of Tolu, Benzoin, and Storax. These are all solid substances. Balsam of Peru is a reddish-brown or nearly black liquid, translucent and dark red, in thin films. It has the consistence of syrup; sp. gr. 1·15; it is insoluble in water, but yields to it traces of cinnamic and benzoic acids. It is completely soluble in five parts of rectified spirit, showing the absence of fixed oil; it should undergo no diminution in volume when mixed with water, showing the absence of alcohol, or of a solution of balsam of Tolu which is said to be sometimes substituted for it. Balsam of Peru has an acrid, slightly bitter taste, and a balsamic odour, due to the presence of about 60 or 70 per cent. of *Cinnamein,* a neutral volatile oil. This is a cinnamate of benzyl ($C_7H_7,C_9H_7O_2$), and when subjected to fractional distillation yields several distinct products—viz., benzoic alcohol and the cinnamic and benzoic ethers; by caustic alkalies it is resolved into cinnamic acid and benzylic alcohol. Balsam of Peru also contains *Metacinnamein,* a crystallisable solid, isomeric with cinnamein; about 6 or 7 per cent. of *Cinnamic acid* ($C_9H_8O_2$), and *resins,* the latter being probably produced by the oxidation of the oil. Lastly, balsam of Peru contains *Styracin* or cinnamate of cinnyl ($C_9H_9,C_9H_7O_2$), which, by the action of potash, is converted into cinnamate of potassium and styrone or cinnylic alcohol. Frémy regards the resins of balsam of Peru as hydrates of the cinnamein; their amount increases with age.

Balsam of Peru is said to be also adulterated with castor oil and copaiba. Freedom from the former impurity is ascertained by adding concentrated sulphuric acid and then water; a little resin is formed if the balsam be pure. Copaiba is detected by distilling a few drops and adding iodine; an explosion results if copaiba be present.

Balsamum Tolutanum.

A reddish or yellowish-brown solid, soft and tenacious at first, becoming hard by age. It has an aromatic taste, and a fragrant balsamic odour, similar to, but less powerful than that of balsam of Peru. It is soluble in rectified spirit, ether, and glacial acetic acid, but not in bisulphide of carbon, which dissolves a large portion of balsam of Peru. Balsam of tolu yields cinnamic acid to water; it is similar in composition to balsam of Peru, but contains, moreover, *Tolene* ($C_{10}H_{16}$), a volatile oil, obtained by distilling the balsam with water.

Ulex states that the presence of common resin in it may be inferred, if, on the addition of sulphuric acid to the balsam, it blackens, swells up, and disengages sulphurous acid.

Physostigmatis Faba.

The plant yielding Calabar bean, or the "ordeal" bean of Old Calabar, is large and climbing, sometimes attaining a height of 50 feet; it bears delicate pink flowers, and has a brown pod or legume which contains several seeds. These are about the size of a very large horse-bean, with a very hard, brittle, shining integument, of a brownish-red, pale-chocolate, or ash-gray colour. Irregularly kidney-shaped, with two flat sides, and a furrow running longitudinally along its convex margin, ending in an aperture near one end of the seed. Within the shell is the kernel, consisting of two cotyledons, weighing on an average about 46 grains; hard, white, and pulverisable, of a taste like that of the ordinary edible leguminous seeds, without bitterness, acrimony, or aromatic flavour. It yields its virtues to alcohol, and imperfectly to water.

The kernel is composed of about 48 per cent. of starch 23 per cent. of legumin, and $\frac{1}{2}$ to $\frac{1}{3}$ per cent. of fatty oil together with mucilage, a little sugar, and the active principle, *Physostigmina* or *Eserine* ($C_{15}H_{21}N_3O_2$). This latter is contained only in the cotyledons, and may be extracted by alcohol. It has been separated as a yellowish amorphous mass, sparingly soluble in water but moderately so in alcohol, chloroform, benzol, and acids. The aqueous solution is tasteless or slightly alkaline and bitter. The solution in acids becomes red on exposure, owing to decomposition of the alkaloid.

Hæmatoxyli Lignum.

The logs consist only of the heart-wood, and are heavier than water; externally they are of a dark colour, internally they are reddish-brown. The chips commonly present a green or greenish-yellow lustre, due to the formation of crystalline hæmatein; they have a sweetish taste and a feeble agreeable odour resembling that of violets; a small portion chewed imparts to the saliva a dark pink colour. The colouring matter of red sandal-wood is not soluble in water, and thus differs from logwood, the colouring and astringent principles of which are soluble in water and alcohol; the solutions are changed to a deep violet colour by alkalies, and are rendered turbid and reddish-yellow by acids. Logwood precipitates ferric salts dark-brown, alum or acetate of lead blue, and gelatine a reddish colour.

It contains from 9 to 12 per cent. of *Hæmatoxyline* ($C_{16}H_{14}O_6$), which, when quite pure, forms white crystals with either one or three atoms of water of crystallisation; it is sometimes found crystallised in the crevices of the wood. *Hæmatoxyline* is soluble in hot water and alcohol, but sparingly in cold water and ether. There are also present tannin, resin, and the ordinary constituents of wood.

Hæmatoxyline is decomposed into Hæmatein ($C_{16}H_{12}O_6$), a crystalline substance with a green hue, by the combined action of oxygen and ammonia, and this body is again converted into *Hœmatoxyline* by the action of hydrogen and sulphurous acid. When fused with caustic potash *Hœmatoxyline* is converted into *Pyrogallic* acid ($C_6H_6O_3$).

Logwood is sometimes mixed with Brazil-wood, the crystalline colouring matter of which, *Brasilin* ($C_{22}H_{20}O_7$), forms a red solution with alkalies. Unlike logwood, Brazil-wood is not dark on the surface.

Senna.

The senna plants are small undershrubs with yellow flowers, bearing alternate pinnate leaves, with from four to eight leaflets along the leaf-stalk.

The leaflets of Alexandrian senna (Cassia acutifolia) are lanceolate or obovate, about an inch long, unequally oblique at the base, brittle, grayish-green, of a faint peculiar odour and a mucilaginous sweetish taste. The leaflets are directed to be carefully freed from the flowers, pods, and leaf-stalks. The unequally oblique base and freedom from bitterness distinguish the senna from the leaflets of *Solinostemna Argel*, which, moreover, are paler in colour, thicker, stiffer, finely rugose, and without lateral nerves on the under surface. The leaflets of *Colutea arborescens*, of *Coriaria myrtifolia*, and of *Lephrosia Apollinea*, are sometimes used to adulterate Alexandrian senna, but they are not met with in English commerce.

The leaflets of Colutea arborescens, or "bladder senna," are ovate and equal at the base; those of Coriaria myrtifolia have a strongly marked lateral nerve on each side of the midrib.

The leaflets of Lephrosia Apollinea have parallel transverse veins and are silky on the under-surface.

The leaflets of Cassia angustifolia are lanceolate, about two inches long, acute, unequally oblique at the base, flexible, green, without any admixture; odour and taste like those of Alexandrian senna.

Indian senna is of two varieties—Tinnivelly senna, and ordinary East Indian, Bombay, or Arabian senna. The former alone is officinal; the leaflets of the latter are smaller, browner, often broken, and frequently mixed with pods and stalks.

Tripoli senna consists chiefly of leaflets of Cassia Æthiopica, a variety of Cassia ovata mixed with Cassia obovata.

Senna imparts its virtues to hot or cold water and to alcohol. It contains *Cathartine* or *Cathartic acid* ($C_{180}H_{192}O_{82}N_4S$?), a peculiar sulphuretted glucoside; it is yellowish-red, deliquescent, and non-crystallisable; the free acid is almost insoluble in water and cold alcohol, but is soluble in ether, chloroform, and warm dilute alcohol; it is readily soluble when combined with alkaline and earthy bases, and in this form it exists in senna. Alkalies aided by heat act destructively on it; when boiled with alcohol and hydrochloric acid it is resolved into sugar and *Cathartogenic acid.*

Besides *Cathartine*, which is stated by some not to be the active principle, senna contains a yellow colouring matter identical with *Chrysophanic acid,* and, according to some, a crystalline sugar, *Catharto-mannite*, which does not ferment and does not precipitate suboxide of copper. It also contains a trace of volatile oil, tartrate and oxalate of lime and potash, together with the ordinary constituents of leaves.

Senna is incompatible with alcohol and mineral acids, and with lime-water, acetate of lead, tartar emetic, corrosive sublimate, and nitrate of silver.

Cassiæ Pulpa.

The fruit is a cylindrical pod or lomentum, from one to two feet long, about the thickness of the thumb; it has three bands running along its whole length. Internally it is divided into many cells by spurious dissepiments, and each cell contains a single oval shining brown seed, surrounded by pulp. This is blackish-brown, viscid-sweet, with a rather sickly odour; it is almost entirely soluble in alcohol and water; it contains about 60 per cent. of cane sugar, pectin, mucilage, a substance analogous to tannin, and some principle probably similar to that contained in senna. On exposure to the air the pulp becomes acid, in consequence of undergoing acetous fermentation.

West Indian pods contain more pulp, and are hence more valuable than the East Indian variety. Those pods should be selected which are heavy and in which the seeds do not rattle.

Tamarindus.

The plant is a large tree, bearing yellow flowers variegated with red veins. The pods are about four or five inches long, three-quarters of an inch broad, flattened, curved, and enclosed in a dry brittle shell or epicarp. They are divided internally into cells, which contain the seeds. These are brown and shining, are enclosed in a membranous coat, and are surrounded by the pulp; this is preserved in sugar, and is brown, sweetish, subacid, and contains strong fibres and seeds. A piece of bright iron left in contact with the pulp for an hour should not exhibit any deposit of copper—an impurity which may be present when the pulp is prepared in copper vessels.

The pulp of the tamarind contains sugar, gum, pectin, free citric, tartaric, and malic acids, bitartrate of potash, etc. The seeds contain a large quantity of tannin. The East Indian pods, "black tamarinds," are larger and thicker than those from the West Indies; they are, moreover, preserved without sugar. The West Indian pods, "brown or red tamarinds," are prepared by removing the epicarp from the ripe fruit and placing alternate layers of the shelled fruit and powdered sugar in a cask; boiling water or syrup is then poured over them.

Copaiba.

Copaiba is an oleo-resin and not a balsam, as it contains neither benzoic nor cinnamic acids. It is about the consistence of olive oil, and is of a light yellow colour—the Brazilian variety, which is chiefly met with, being much paler than the West Indian. It is transparent, has a peculiar odour, and an acrid aromatic taste. Its sp. gr. is about 0·95. It is insoluble in water, but entirely soluble in absolute alcohol, ether, fixed and volatile oils, and in strong alkaline solutions if much resin be present. It is perfectly soluble in an equal volume of benzol, does not become gelatinous after having been heated to 270°, and it is not fluorescent; these last three characters show the absence of East Indian wood-oil, or *gurjun balsam*, the product of several species of Dipterocarpus. It dissolves one-fourth of its weight of carbonate of magnesia by the aid of heat, and remains transparent, showing the absence of castor-oil and other fixed oils. If present, the latter can also be detected by a diffused greasy stain being left when a little of the suspected specimen is heated on paper. Turpentine is sometimes used to adulterate copaiva, and may be detected by its odour on heating the drug on a spatula or on paper.

Copaiva consists of about 52 per cent. of resin and 40 per cent. of volatile oil, but the proportions vary with age and exposure. The resin, *Copaivic acid* ($C_{20}H_{30}O_2$), closely resembles common resin; is yellow, crystalline, and brittle; soluble in alcohol, rectified spirit, ether, and in fixed and volatile oils; it is decomposed by sulphuric and nitric acids.

The volatile oil ($C_{10}H_{16}$) is obtained by distillation; it is closely allied to oil of turpentine; is colourless, with the odour and taste of copaiva. Besides these, copaiva contains about 1½ to 2 per cent. of a soft, brown, resinous matter, the nature of which is unknown, but which is supposed by Gerber to be the result of some alteration of the acid resin; its proportion increases with the age of the drug.

Acaciæ Gummi.

Gum Arabic, as it is generally called, occurs in spheroidal tears, usually from half to one inch in length, nearly colourless and opaque from numerous minute cracks, or in fragments with shining surfaces. Senegal or Barbary gum is met with in larger, coloured, and less pure pieces. Gum acacia is brittle; bland and mucilaginous in taste; insoluble in alcohol, but soluble in water. The aqueous solution gives no precipitate with neutral acetate of lead; but with subacetate of lead it forms an opaque white jelly of gummate of lead ($Pb_2O,3C_6H_{10}O_5$). If an aqueous solution of iodine be added to the powder or to a solution formed with boiling water *and cooled*, there is no appearance of a violet or blue colour, showing the absence of starch. The solution must be cooled, as the colour of iodide of starch is discharged at a high temperature.

Gum consists of *Gummic* or *Arabic acid* or *Arabin* ($C_6H_{10}O_5$), in combination with lime, magnesia, and potash, from which it can be separated by dialysis. It is a colourless, odourless, insipid, uncrystallisable solid. A small quantity of alkali renders it soluble in water, and the solution resembles one of ordinary gum; it is allied to the isomeric bodies *Cerasin* and *Prunin*, *Bassorin* or *Tragacanthin*, and vegetable mucus.

Gum contains 17 per cent. of water; at 212° it loses 12 to 16 per cent. of water, equal to about 3 molecules, and at 300°

it loses another molecule and becomes insoluble. It also contains a small quantity of malate of calcium, chlorides of calcium and of potassium, and traces of iron, silicon, and phosphate of calcium.

By nitric acid gum is converted into mucic and oxalic acids, and by sulphuric acid into dextrin and sugar. Solution of oxalate of ammonium gives with solution of gum a white precipitate of oxalate of calcium, showing the presence of the latter. Alcohol, ether, chloroform, acetate and subacetate of lead, the mercurial nitrates and neutral oxalates, all produce deposits in a solution of gum, and are hence incompatible with it; borax and perchloride of iron render it gelatinous.

Chrysarobinum.

The medullary matter of the stem and branches, dried, powdered, and purified. As purified by solvents it is a light, brownish-yellow, minutely crystalline powder, tasteless and inodorous. Very sparingly soluble in water, but almost entirely so in 150 parts of hot rectified spirit. On heating it melts, and partially sublimes in yellow vapour, leaving a charred residue, which entirely disappears on ignition in air. It dissolves in sulphuric acid to form a yellow or orange-red solution, and in solution of caustic potash, to form a yellow or reddish fluorescent solution, which becomes carmine by absorption of oxygen from the air.

It contains a varying amount of *Chrysophanic acid* increased by oxidation.

Indigo.

Indigo (C_8H_5NO) is a blue pigment prepared from various species of Indigofera, chiefly the I. tinctoria. It usually occurs in cubical cakes of an intensely blue colour; odourless, but possessing a metallic taste. When rubbed with a smooth hard body, indigo assumes a coppery or bronze-like hue. When heated to about 550° it evolves violet vapours, which condense in minute crystals; it is thus distinguished from Prussian blue. The blue colouring matter, *Indigotin*, is not soluble in water or alkaline solutions, but forms several compounds with sulphuric acid. By the action of deoxidising agents blue indigo is changed into white indigo or Indigogen (C_8H_6NO), which is soluble in water; on exposure to air it again becomes converted into blue indigo. According to Schunck the indigo producing constituent is *Indican* ($C_{26}H_{31}NO_{17}$), for this, when heated with sulphuric or hydrochloric acids, is resolved into indigo, indigo-red, and *Indiglucin* ($C_6H_{10}O_6$), a variety of sugar. Indican is a yellow, amorphous, deliquescent body; soluble in water, alcohol, and ether. The aqueous solution is decomposed by heat, and then yields, when boiled with acids, indigo-brown. Indigo-blue is metameric with benzoyl cyanide; by destructive distillation it yields carbonate and cyanide of ammonium and *Aniline.*

Indigo is introduced into the Appendix of the Pharmacopœia for making the solution of the sulphate. 5 grains of dry indigo are dissolved in 1 drachm of sulphuric acid by heat, and the resulting solution is diluted with sulphuric acid until the whole measures 10 oz. This solution contains Sulphindigotic acid ($C_8H_5NO.SO_3$), a peculiar compound of the acid and the colouring matter. It is used as a test for free chlorine in hydrochloric acid and liquor sodæ chloratæ, and for nitric acid in carbonate of bismuth. If free chlorine in the first place, and nitric acid in the second be present, the colour of the sulphindigotic acid will be destroyed.

ROSACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
PRUNUS AMYGDALUS Bitter and Sweet Almond (*Bitter variety from Mogadore; sweet from Malaga*)	Seed	Oleum Amygd. Pulv. Amygd. Co. Mist. Amygd.	— 8 pts. in 13 2½ ozs. to 1 pnt.	1 drm. to ½ oz. 1 to 2 drms. 1 to 2 ozs.	Demulcent. Vehicles for other medicines. The oil used in preparation of many ointments.
HAGENIA ABYSSINICA Cusso or Kousso (*Abyssinia*)	Flowers and tops	Infusum Cusso	¼ oz. to 4 ozs.	4 to 8 ozs.	Tæniacide.
PRUNUS DOMESTICA Common Plum Tree (*Syria and Southern Europe*)	Dried drupe	—	—	—	Laxative. Employed in preparation of Confection of Senna.
PRUNUS LAUROCERASUS Common or Cherry Laurel (*Asia Minor. Cultivated in England*)	Fresh leaves	Aqua Laurocerasi	1 lb. to 1 pt.	5 to 30 mins.	Sedative. Has similar effects to those of Dilute Hydrocyanic Acid.
ROSA CANINA Dog Rose (*Indigenous*)	Fresh fruit	Confectio Rosæ Caninæ	1 pt. in 3	—	As a basis for pill masses.
ROSA CENTIFOLIA Cabbage or Hundred-leaved Rose (*Britain*)	Fresh petals fully expanded	Aqua Rosæ	10 lbs. to 1 gallon	—	Used chiefly as a vehicle for lotions and collyria; and in preparing Mist. Ferri Co. and Trochisci Bismuthi.
ROSA GALLICA Red Rose (*Austria and Southern Europe. Cultivated in Britain*)	Fresh and dried unexpanded petals	Confectio Rosæ Gallicæ Infusum Rosæ Acidum Syrupus Rosæ Gallicæ	1 pt. in 4 ½ oz. to 1 pnt. —	— 1 to 2 ozs. 1 drm.	Slightly astringent. The infusion used chiefly as a gargle and as an agreeable vehicle; the syrup as a colouring agent, and the confection as a basis for all the aloetic as well as other pill masses.

Amygdala Amara.

Bitter almonds resemble the sweet variety in appearance, but are broader and shorter, have a bitter taste, and when rubbed with water emit a characteristic odour.

Both varieties of almonds yield on expression about 50 per cent. of Oleum Amygdalæ. This consists almost entirely of olein—and whether obtained from the bitter or sweet variety is the same in composition and properties, being almost odourless, with a bland oleaginous taste; it becomes rancid on exposure to air, but does not dry. Both varieties of almonds also contain *Emulsine* or *Synaptase*, an albuminous principle which is soluble in water; they also contain sugar, gum, woody fibre, and inorganic salts, chiefly phosphates of potassium, calcium, and magnesium. In addition to these, the bitter almonds contain about 2½ per cent. of a peculiar white crystalline glucoside, Amygdaline ($C_{20}H_{27}NO_{11} + 3H_2O$), which is soluble in water and alcohol. On moistening bitter almonds the Amygdaline is acted on by the Emulsine, and a species of fermentation ensues, resulting in the formation of *hydrocyanic acid* and *volatile oil of bitter almonds*, or *hydride of benzoyl* (C_7H_5O,H), together with a little glucose and formic acid. 17 grains of Amygdaline mixed with 1 oz. of Emulsine furnish 1 grain of pure hydrocyanic acid, which is equivalent to 50 minims of the officinal dilute acid. Cold water should be used, for boiling water coagulates the Emulsine and prevents the fermentation.

The volatile oil of bitter almonds, when deprived of hydrocyanic acid, is not poisonous. On exposure to air it absorbs oxygen, and is converted into Benzoic acid ($C_7H_6O_2$). The oil, which is sold in the shops, contains from 4 to 8 per cent. of hydrocyanic acid, and hence is extremely poisonous. The acid may be separated by agitating the oil with a mixture of milk of lime and ferrous chloride, and then distilling.

Amygdala Dulcis.

The sweet or Jordan almonds are above an inch in length, are lanceolate, acute, with a clear cinnamon-brown seed-coat; they are odourless, but the kernel has a bland, sweetish nutty flavour. They do not evolve the odour of bitter almonds when bruised with water. Almonds should be entire, dry, white and brittle; when of bad quality or when long kept, they are soft, flexible, and translucent. By soaking in warm water, the seed-coats are removed, and the kernels are then termed "blanched almonds."

Sweet almonds have the same constitution as the bitter variety, but they do not contain *Amygdaline*, and they contain a rather greater quantity of sugar and fixed oil.

Cusso.

The flowers are diœcious, small, reddish-brown, on hairy stalks, outer limb of calyx five-parted, the segments oblong or oblong-lanceolate and reticulated. The general colour of kousso, viewed *en masse*, is yellowish-green; it has a tea-like odour. Kousso contains a volatile oil, gum, sugar, tannic acid, wax, an acrid bitter resin, and a crystallisable principle, *Koussine* or Kosin ($C_{31}H_{38}O_{10}$). It forms fine yellow rhombic crystals, which are tasteless, insoluble in water, but freely soluble in boiling alcohol, in ether, chloroform, benzol, glacial acetic acid, and in solutions of caustic alkalies and of alkaline carbonates.

The infusion and decoction of kousso are turned a dark green with persalts of iron.

"Red cusso" consists of the female flowers with a large reddish calyx, and is said to be the most active.

Prunum.

The dried drupe of the plum is about an inch long, ovate, wrinkled, black, and with a sweet, somewhat austere taste. It contains free malic acid, about 25 per cent. of glucose, gum, pectin, oxalate of calcium, and a purgative principle of an unknown nature.

Laurocerasi Folia.

The Cherry-laurel has no relation with the true laurel or sweet Bay-tree (Laurus nobilis). The leaves are from four to five inches long and about two broad; they are ovate-lanceolate or elliptical, coriaceous, distinctly toothed, furnished with glands at the base; smooth, shining, and deep green on the upper surface, but dull and of a lighter colour on the under-surface; they are borne on strong, short foot-stalks. Cherry-laurel leaves emit a ratafia odour when bruised. On distillation with water they yield volatile oil and some hydrocyanic acid, neither of which pre-exist in the leaves. The latter, however, contain Amygdaline and Emulsine or analogous substances, by the mutual reaction of which the oil and acid are formed. The volatile oil resembles that of bitter almonds in composition and properties. The leaves also contain sugar, fat, and a little tannic acid. The proportion of hydrocyanic acid yielded varies with the time of year, only half as much being obtained in winter as in July and August.

Rosæ Caninæ Fructus.

The ripe fruit or hips of the Dog-rose are about an inch or more in length—ovate, scarlet, smooth, and shining, with a sweet subacid pleasant taste. In making the confection they are deprived of their hairy "seeds" or achenes (fruit). The pulp contains citric and malic acids, citrates and malates of potassium and calcium, tannic acid, sugar, gum, and a trace of volatile oil.

Rosæ Centifoliæ Petala.

The fully expanded petals have a sweetish, bitter and faintly astringent taste and roseate odour, both readily imparted to water. They may be preserved fresh for some time by compressing them with alternate layers of common salt in closed vessels. Unlike the petals of Rosa gallica, their fragrance is diminished by desiccation.

The odour is due to the presence of about 0·04 per cent. of a volatile oil known as Attar, or Otto, of Roses, which is prepared in the East. It is a bright oil with a faint straw-coloured tinge, having a specific gravity of from ·87 to ·89. It becomes solid when mixed with alcohol, or when heated up to between 60° and 68°, owing to the formation of crystalline lamellæ of Stearoptene ($C_{20}H_{40}$), which is present in the proportion of about 18 per cent. in Turkish oil, and 60 per cent. in inferior English oils. Attar of Roses is adulterated with geranium oil, the volatile oil of Andropogon Schœnanthus.

The petals also contain colouring matter, a slight laxative principle, traces of tannic, gallic, malic, and tartaric acids, fat, resin, and sugar.

Rosæ Gallicæ Petala.

The unexpanded petals of the French rose have a fine purplish-red colour, which is retained after drying, but which is impaired on exposure to light and air; their taste is bitterish, feebly acid and astringent; their odour is roseate and is developed by drying. They contain red colouring matter which has not yet been isolated; they also contain tannic and gallic acids, hence the infusion gives a dark colour with ferruginous salts and a slight precipitate with gelatine; they contain, moreover, a glucoside called *Quercitrin* ($C_{18}H_{18}O_{10}H_2O$), the yellow crystallisable colouring matter in the bark of Quercus tinctoria; this, when boiled with dilute sulphuric acid, is resolved into glucose and *Quercetin* ($C_{27}H_{18}O_{12}$). Besides these, the petals contain a trace of volatile oil, a little fat, and sugar. An infusion of the petals becomes bright red with acids and green with alkalies.

MYRTACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
EUGENIA CARYOPHYLLATA Cloves (*East India Islands, etc.*)	Dried unexpanded flower-buds	Infusum Caryophylli Oleum Caryophylli	½ oz. to 1 pnt. —	1 to 4 ozs. 1 to 5 mins.	Stimulant. Carminative. Oil, locally in toothache, and as an adjunct to purgatives. Contained in Infus. Aurant. Co., Mist. Ferri Ar., and Vinum Opii.
PIMENTA OFFICINALIS Pimento or All-spice (*West India Islands*)	Unripe fruit	Aqua Pimentæ Oleum Pimentæ	14 ozs. to 1 gall. —	1 to 2 ozs. 1 to 5 mins.	Stimulant. Carminative. An adjunct to purgatives. Contained in Syrup.Rhamni.
EUCALYPTUS GLOBULUS Eucalyptus or Blue Gum Tree (*South Europe, etc.*)	The leaves	Oleum Eucalypti Unguentum Eucalypti	— 1 pt. in 5	1 to 4 mins. —	The growing plant is said to prevent malaria. The oil is antiseptic, and is given internally as a stimulant and antispasmodic. It is also used as an inhalation in cases of bronchitis, etc.
MELALEUCA MINOR Cajeput (*Molucca Islands*)	Oil from leaves	Oleum Cajeputi Spiritus Cajeputi	— 1 of oil in 50	1 to 5 mins. ½ to 1 drm.	Rubefacient, stimulant, antispasmodic, diaphoretic. Used in rheumatism, colic, hysteria, etc.
PUNICA GRANATUM Pomegranate (*South of Europe*)	Dried bark of root	Decoctum Granati Radicis	2 ozs. to 1 pnt.	1 to 2 ozs.	Tæniacide.

Caryophyllum.

Cloves are nail-like in appearance, about six lines long, dark reddish-brown, plump, and heavy, consisting of a nearly cylindrical body or calyx-tube surmounted by four teeth, and a globular head, which is the unopened corolla. They possess a strong fragrant odour and a bitter, spicy, pungent taste; they emit oil when indented with the nail. Inferior cloves are light, wrinkled, yellowish, and of a feeble taste and odour. The best cloves come from Amboyna. Mother cloves are the dried fruits of the clove tree.

Cloves contain about 18 per cent. of a volatile oil, some salicylic acid, resin, a variety of tannin, lignin, and water.

The volatile oil consists of a hydrocarbon ($C_{10}H_{16}$) which is isomeric with oil of turpentine; this holds in solution *Eugenic acid* ($C_{10}H_{12}O_2$); a crystalline body, *Caryophylline* ($C_{10}H_{16}O$), isomeric with camphor; and, lastly, *Eugenine*, which is probably isomeric with Eugenic acid. Volatile oil of cloves is light yellow when fresh, but gradually becomes red-brown from a resinous change in the Eugenic acid; its specific gravity is 1·055 to 1·060, being one of the few volatile oils which are heavier than water; it has the odour and taste of cloves.

Solutions containing cloves strike black with ferruginous salts. The infusion and the oil are reddened by nitric acid, and turned blue by perchloride of iron—giving, in fact, the same colours as morphine. The infusion and oil of pimento are similarly affected.

Pimenta.

The allspice fruit, or "Jamaica pepper," as it is sometimes called, is gathered before it ripens, for, if allowed to ripen, it loses its aromatic warmth and acquires a flavour like that of juniper. It is about the size of a small pea, brown, rough, crowned with the teeth of the calyx, yellowish within, and containing two dark-brown seeds; the odour and taste is aromatic, hot, and peculiar. It contains about from 3 to 4½ per cent. of a volatile oil, which is heavier than water and appears to be identical with that of cloves. Allspice also contains a fixed oil, resin, a large quantity of tannin, starch, etc.

Oleum Eucalypti.

Colourless or pale straw-coloured, becoming darker and thicker on exposure. It has an aromatic odour and a spicy, pungent flavour, leaving a sensation of coldness in the mouth. It is neutral to litmus paper, sp. gr. about 0·900. Soluble in about an equal weight of alcohol.

Oleum Cajeputi.

Very mobile, transparent, of a fine pale bluish-green colour. It has a strong, disagreeable odour, and a warm aromatic taste, leaving a sensation of coldness in the mouth; its specific gravity is 0·925. When distilled, a colourless oil comes over, which is *Hydrate of Cajeputene* ($C_{10}H_{16}.H_2O$). This constitutes two-thirds of the crude oil.

Copper has been detected as an adulteration of oil of cajeput, probably owing to its having been kept in copper vessels to preserve its colour. Camphor dissolved in oil of rosemary and coloured with copper has been said to have been substituted for the genuine oil.

Granati Radicis Cortex.

Occurs in quills or fragments of a grayish-yellow colour externally and yellow internally. When the inner surface is moistened with water and rubbed on paper it produces a yellow stain which is rendered blue by ferrous sulphate, and rose colour by nitric acid. The bark breaks with a short fracture, has but little odour, and an astringent, very slightly bitter taste. It contains about 20 per cent. of *Punico-tannic* acid ($C_{20}H_{16}O_{13}$), a little gallic acid, some mannite, and a principle termed *Punicine.*

It is sometimes adulterated with the root-bark of box and the branch-bark of barberry.

The fruit of the pomegranate was formerly officinal; it resembles an orange, but has a coriaceous rind, and is crowned with a toothed calyx. The rind contains about 20 per cent. of tannin, together with extractive and mucilaginous matters.

CUCURBITACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
CITRULLUS COLOCYNTHIS Colocynth (*Mediterranean Shores*)	Pulp of fruit	Pulv. Coloc.	—	2 to 8 grs.	Drastic purgative. In constipation. dropsy, amenorrhœa, cerebral affections.
		Extr. Coloc. Co.	1 in $4\frac{1}{2}$	3 to 10 grs.	
		Pil. Coloc. Co.	1 in 6	5 to 10 grs.	
		Pil. Coloc. et Hyoscyami	1 in 9	5 to 10 grs.	
ECBALLIUM ELATERIUM Squirting or Wild Cucumber (*Southern Europe*)	Nearly ripe fruit	Elaterium	—	$\frac{1}{16}$ to $\frac{1}{2}$ gr.	Hydragogue purgative in dropsies.
		Elaterinum	—	$\frac{1}{40}$ to $\frac{1}{10}$ gr.	
		Pulv. Elaterini Co.	1 in 40	$\frac{1}{2}$ to 5 grs.	

Colocynthidis Pulpa.

The wild cucumber is an annual creeping plant, bearing considerable resemblance to the common water melon. The fruit was formerly imported from Mogadore unpeeled, but is now obtained only from the Mediterranean ports peeled. It is a globular pepo, about the size of an orange, with a hard, yellow rind. The pulp is light, spongy, white or yellowish-white, having an intensely bitter taste. The oval, brownish seeds form about 72 per cent. of the weight of the fruit, and are ordered to be removed.

Colocynth pulp contains a crystallisable glucoside, *Colocynthin* ($C_{56}H_{84}O_{23}$), which is soluble in water and alcohol, but not in ether, and is decomposed by boiling with acids into glucose and a resin, *Colocynthein* ($C_{44}H_{64}O_{13}$). Walz has also separated another principle, *Colocynthitin*, a tasteless crystalline powder. The pulp also contains a bitter resin, a bitter principle, mucilaginous matters, lignin, and phosphates of lime and magnesia.

Ecballii Fructus.

The wild or Squirting cucumber is a monœcious trailing plant like the common cucumber, but without tendrils. The leaves are large, rough, and irregularly cordate, and the yellow flowers spring from their axils. The fruit is a small elliptical pepo, about 1½ inch long, green, covered with soft prickles, and containing the seeds surrounded by a juicy tissue; these, when the fruit is ripe, are expelled forcibly through an opening in the base—hence the name of the plant. The cause of the bursting is the osmose of the thin outer fluid into the thick central fluid, which is surrounded by a delicate membrane. This goes on until at last the fruit yields at its weakest point—namely, at its attachment to the stalk.

Elaterium.

Is prepared by taking a pound of the nearly ripe fruit of the squirting cucumber and cutting it lengthwise; the juice is then lightly pressed out, strained through a hair sieve, and set aside to deposit. The supernatant liquor is then carefully poured off, and the sediment is collected on a linen filter and dried on porous tiles with a gentle heat. The decanted fluid may deposit a second portion of sediment, which can be dried in the same way. Elaterium so prepared was formerly termed the extract. About half an ounce of elaterium is yielded by 40 pounds of the fruit.

Elaterium occurs in light, slightly incurved cakes, somewhat resembling vulcanised India-rubber, about one line thick, greenish-gray, acrid and bitter, with a finely granular fracture. It does not effervesce with acids, showing the absence of chalk; and does not give a blue colour with iodine, indicating the absence of starch. It yields half its weight to boiling rectified spirit; this, when concentrated and added to warm solution of potash, should yield, on cooling, not less than 20 per cent. of *Elaterine* in colourless crystals. Inferior elaterium is thicker, darker, less easily broken, and sinks in water; the Maltese is inferior to the English variety. Elaterium also contains a green resinous matter, which is soluble in ether, together with woody fibre, etc.

Starch and flour or chalk are used to adulterate elaterium.

Elaterinum. ($C_{20}H_{28}O_5$).

Is the active principle of elaterium.

It is a chemically neutral substance, in small colourless crystals which have a bitter taste. It is insoluble in water, sparingly soluble in rectified spirit.

It is obtained by exhausting elaterium with chloroform, adding ether to the solution in chloroform, collecting the precipitate, washing the latter with ether, and purifying by recrystallisation from chloroform.

With melted carbolic acid it yields a solution which, on the addition of sulphuric acid, acquires a crimson colour rapidly changing to scarlet. It is not precipitated from solution by tannic acid nor by the salts of mercury or platinum. Heated with access of air it first melts and then burns, leaving no residue.

UMBELLIFERÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
Conium Maculatum Hemlock (*Britain*)	*a*. Fresh leaves and young branches	Extractum Conii	—	2 to 6 grs.	Causes paralysis by affecting the motor nerves. Locally, destroys nervous conductivity. Is therefore sedative and antispasmodic.
		Pil. Conii Co.	2½ in 3	5 to 10 grs.	
		Succus Conii	1 gr. Ext. in 12 mins.	30 to 60 mins.	
		Cataplasma Conii	1 oz. of Succus	—	
		Vapor Coninæ	1 in 5	20 mins. on sponge	
	b. The dried ripe fruit	Tinctura Conii	54½ grs. to 1 oz.	20 to 60 mins.	

UMBELLIFERÆ (*continued*).

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
FERULA NARTHEX Asafœtida (*Persia and Northern India*)	Gum-resin obtained by incisions into the root	Asafœtida	—	5 to 20 grs.	Stimulant, antispasmodic. Useful in hysteria and tympanitis.
		Enema Asafœt.	30 grs. to 4 oz.	—	
		Pil. Aloes et Asafœtidæ	1 pt. in 4	5 to 10 grs.	
		Pil. Asafœt. Co.	1 pt. in 3½	5 to 10 grs.	
		Spt. Ammoniæ Fœtidus	33 grs. to 1 oz.	½ to 1 drm.	
		Tinct. Asafœt.	54½ grs. to 1 oz.	½ to 1 drm.	
FERULA GALBANIFLUA Galbanum (*India and Levant*)	Gum-resinous exudation	Empl. Galbani	1 pt. in 11	—	Stimulating expectorant. Plaster used to discuss tumours. In Pil. Asafœtid. Co. (1 in 3½.)
DOREMA AMMONIACUM Ammoniacum (*Persia and India*)	Gum-resinous exudation	Empl. Ammoniaci cum Hyd.	12 pts. in 15	—	Stimulating expectorant and local irritant. Enters into Empl. Galbani, Pil. Scillæ Co., and Pil. Ipecac. cum Scilla.
		Mist. Ammoniaci	13½ grs. to 1 oz.	½ to 1 oz.	
PIMPINELLA ANISUM Anise (*Southern Europe*)	Fruit	Oleum Anisi	—	2 to 5 mins.	Aromatic stimulant and carminative. Used to relieve flatulence. Oleum contained in Tinct. Camph. Co., and Tinct. Opii Ammon.
		Essentia ,,	1 vol. in 5	10 to 20 mins.	
		Aqua ,,	1 lb. to 2 gals.		
FŒNICULUM CAPILLACEUM Sweet Fennel (*Southern Europe*)	Fruit	Aqua Fœniculi	1 lb. to 1 gall.	1 to 2 ozs.	Aromatic stimulant and carminative. Relieves flatulence. In Pulv. Glycyrr. Co.
CORIANDRUM SATIVUM Coriander (*Europe*)	Fruit	Oleum Coriandri	—	2 to 5 mins.	Aromatic stimulant and carminative. Used to prevent griping of purgative medicines. In Syrup. and Tinct. Rhei and Confect. and Tinct. Sennæ. The oil is contained in Syr. Sennæ and in Mist. Gentian.

UMBELLIFERÆ (*continued*).

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
CARUM CARUI Caraway (*Mid-Europe*)	Fruit	Aqua Carui Oleum ,,	1 lb. to 1 gall. —	1 to 2 ozs. 2 to 5 mins.	Stimulant carminative. Relieves flatulence. The fruit is contained in Conf. Piperis, Pulv. Opii Co., Tinct. Card. Co., and in Tinct. Sennæ; and the oil in Conf. Scammonii and in Pil. Aloes Barb.
PEUCEDANUM GRAVEOLENS Dill (*Southern Europe*)	Fruit	Aqua Anethi Oleum Anethi	1 lb. to 1 gall. —	1 to 2 ozs. 2 to 5 mins.	Stimulant carminative. Useful in flatulence of children and as an adjunct to purgatives.
FERULA SUMBUL Sumbul or Muskroot (*Bokhara*)	Root	Tinctura Sumbulis	54½ grs. to 1 oz.	10 to 30 mins.	Nervine stimulant and antispasmodic.

Conii Folia et Fructus.

The leaves are best gathered when the flowers begin to fade. They are decompound, smooth, arise from a smooth stem, which is not swollen at the nodes, but is marked with dark purple spots. The fruit is about one-tenth of an inch long, dull gray, broadly ovate, compressed laterally, splits readily when ripe into two 5-ribbed half fruits (mericarps), and is distinguished from other umbelliferous fruits by having undulating crenated edges and no vittæ. According to Dr. J. Harley's researches, the dried ripe fruit is almost inert. The leaves and fruit rubbed with solution of potash give out a powerful odour.

Both leaves and fruit contain a non-poisonous volatile oil, to which the characteristic odour is due; they also contain *Conine* or *Cicutine* ($C_8H_{15}N$), a volatile liquid alkaloid which exists in combination with *Conic acid.* An ounce of the fruit yields about 3 grains of the alkaloid. Conine is colourless when pure, and has a peculiar, mouse-like odour; its specific gravity is ·87; it is soluble in ether and alcohol; it is slightly soluble in water, and more so in cold than in hot; it enters into combination with water, forming a *hydrate of Conine.*

Conine is the only alkaloid besides *Aniline* which coagulates albumen. It is strongly alkaline, neutralising strong acids; sulphuric acid turns it purplish-red, changing to green; with nitric acid it gives a blood-red colour; warmed gently with hydrochloric acid it forms a bluish-green crystalline mass. When exposed to the air, conine is resolved into ammonia and a bitter non-poisonous extractive. It produces a greasy stain on paper which disappears on heating. Conine is always associated with a variable proportion of *Methylconine* ($C_8H_{14}CH_3N$), a base which closely resembles it in physical properties. Hemlock also contains another base, *Conhydrine* ($C_8H_{15}N.H_2O$), which is strongly alkaline and sublimes in colourless needles.

Conine is set free from its combination in the plant by potash, when it may be distilled, and is recognised by its odour and the fumes which it gives with hydrochloric acid; its vapour is inflammable. Conine has been artificially prepared by Schiff by the action of ammonia on butyl-aldehyd with the aid of heat. The dried leaves of Hemlock, even when most carefully prepared, sometimes fail to yield conine; the most efficient preparations are obtained from the green and *nearly* ripe fruit.

The leaves of several species of Chærophyllum, especially C. Anthriscus and those of Æthusa Cynapium, or Fool's Parsley, may be confounded with hemlock leaves. The development of the odour of conine on adding solution of potash is the conclusive distinction between them.

Asafœtida.

This is met with in irregular masses, partly composed of tears; it is moist when recent, but gradually becomes hard and dry. The colour of a freshly-cut or broken piece is opaque white, but it soon becomes purplish-pink and ultimately dull yellowish or pinkish-brown, owing to the action of air and light on the resinous ingredient; its taste is bitter, nauseous, and acrid, and the odour is fœtid, alliaceous, and persistent. Asafœtida dissolves almost entirely in rectified spirit, showing the absence of mechanical impurities, as sand, stones, etc. Pulverisation of it is facilitated by trituration with carbonate of ammonium, or by incorporating with it while warm from 4 to 10 per cent. of magnesia.

Asafœtida contains about 4 per cent. of volatile oil, on which its odour depends, and which consists of a mixture of Sulphide of Allyl [$(C_3H_5)_2S$] and Sulphide of Hexyl [$(C_6H_{11})_2S$]. The volatile oil is at first colourless, but becomes yellowish and rancid on exposure; it is soluble in alcohol and ether, but requires more than 2,000 times its weight of water to dissolve it; the presence of sulphur in it is shown by the formation of sulphuret of mercury on rubbing it with mercury. Silvered pills of asafœtida too become blackened owing to the formation of sulphide of silver.

Asafœtida also contains about 65 per cent. of resin; this yields a crystallisable acid, *Ferulaic acid* ($C_{10}H_{10}O_4$); with caustic potash it yields *Resorcin* ($C_6H_6O_2$), a homologue of *Orcin;* when subjected to dry distillation, it yields greenish and purplish oils and about $\frac{1}{4}$ per cent. of *Umbelliferone* ($C_9H_6O_3$), which is isomeric with *Quinone.* Asafœtida also contains 25 per cent. of gum, some saline matter, and traces of malic, acetic, formic, and valerianic acids.

Galbanum.

Occurs in irregular tears about the size of a pea, agglutinated into masses of a greenish-yellow colour, translucent, having a strong disagreeable odour and an acrid bitter taste. With water it forms an imperfect emulsion, and is almost entirely soluble in proof spirit. It contains about 3·5 per cent. of volatile oil which does not contain sulphur, and which is isomeric with oil of turpentine ($C_{10}H_{16}$); it also contains about 65 per cent. of a dark, yellowish-brown, transparent, brittle, and tasteless resin. This yields *Umbelliferone* ($C_9H_6O_3$), a blue oil ($C_{20}H_{30}O$) which appears to be identical with blue oil of chamomile, and a colourless oil ($C_{20}H_{30}$). When fused with caustic potash the resin yields *Resorcin*, acetic, and volatile fatty acids.

Ammoniacum.

In tears or masses. The tears are from two to eight lines in diameter, pale cinnamon-brown, breaking into a smooth, shining, opaque, white surface. The masses are composed of agglutinated tears. Ammoniacum is hard and brittle when cold, but softens readily with heat; at a red heat it burns with a white flame. It has a faint peculiar odour, and a bitter, acrid, nauseous taste. Its specific gravity is 1·2. Rubbed with water it forms a nearly white emulsion, the resin and oil being suspended by the dissolved gum. It is soluble in ether and alcohol.

Ammoniacum contains about 70 per cent. of resin, which is partly acrid and partly neutral; likewise about 4 per cent. of volatile oil, which does not contain sulphur, and about 20 per cent. of gum. It is destitute of *Umbelliferone*, but yields a little *Resorcin* when fused with potash.

Rubbed up with camphor, ammoniacum forms at once a mass suitable for pills.

Anisi Oleum.

The fruit which is termed Aniseed is not now officinal. The separated mericarps, or so-called seeds, are oblong-ovate, whitish-brown, downy, with five primary ridges (*juga*), which are smooth and not crenulated at the margins; there are three vittæ or oil-ducts in each channel. The fruit of hemlock has been mistaken for that of anise; but it may be at once distinguished by the development of the mouse-like odour from the former on trituration with potash.

The volatile oil of anise is of a light straw colour, with a warm sweetish taste. Its specific gravity is 0·977 to 0·99, but increases with age. It concretes at 50°, and is soluble in all proportions in alcohol. By exposure to air it forms a resin, and becomes less disposed to concrete. Oil of anise consists of two portions, one-fifth being constituted of a liquid oil, *Anethene*, isomeric with oil of turpentine ($C_{10}H_{16}$), and four-fifths consisting of an oil which solidifies below 50°. This latter, Anethol or Anise-Camphor ($C_{10}H_{12}O$), is easily oxidised, and then yields substances which may be regarded as compounds containing the radicle *Anisyl* ($C_8H_7O_2$). Dilute nitric acid converts oil of anise into oxalic and *Anisic* acids ($C_8H_8O_3$), and *Anisyl hydrate* ($C_8H_8O_2$), which is homologous with oil of meadow sweet, and has the odour of new hay.

Oil of anise is sometimes adulterated with spermaceti, which is known to be present by its insolubility in cold alcohol; it is also adulterated with wax, camphor, and alcohol. Oil of Star-Anise (page 99) is sometimes sold for it, and may be distinguished by the fact that it retains its fluidity at 35°.

Fœniculi Fructus.

The fruits or so-called seeds are about three lines long and one broad, elliptical, slightly curved, beaked, having eight pale-brown longitudinal ridges—the two lateral being double; the taste and odour are aromatic. The fruits yield from 3 to 4 per cent. of volatile oil, which is of a light yellow colour, and possesses the odour of the seeds; it is the active ingredient, and nearly corresponds in proximate composition to oil of anise. Fennel fruit also contains sugar and about 12 per cent. of fixed oil.

Coriandri Fructus et Oleum.

Coriander fruit is globular, nearly as large as white pepper, beaked, finely ribbed, yellowish-brown; it acquires an aromatic odour and flavour when kept, but all parts of the fresh plant are very fœtid when bruised. It consists of two adherent carpels, which are readily separated. The oil ($C_{10}H_{16}.H_2O$) is yellowish, and has the odour of the fruit. It consists chiefly of a mixture of two oils, one a volatile oxygenated oil, and the other a less volatile non-oxygenated oil. Its specific gravity is 0·859 to 0·871; it is soluble in alcohol, ether, and glacial acetic acid.

Carui Fructus et Oleum.

The caraway seed, so called, usually separates into two parts (mericarps); they are dark brown, are about two lines long, are slightly curved, and taper at the ends; they have five fine filiform ridges and contain a single vitta in each channel. The longitudinal ridges are of a lighter colour than the intervening interstices; they possess an agreeable aromatic odour and taste.

Caraway fruit contains a volatile oil which is colourless at first, but becomes yellowish on keeping; its specific gravity is 0·946. It consists of two portions—one unoxidised, *Carvene* ($C_{15}H_{24}$), and the other oxidised, *Carvol* ($C_{10}H_{14}O$), which is isomeric with *Menthol*, *Myristicol*, and *Thymol*. Oil of Caraway has the characteristic odour and taste of the fruit.

Anethi Fructus et Oleum.

The fruits, or so-called "Dill-seeds," are brown, oval, somewhat flattened, about a line and a half long, convex on one side, concave on the other; the Indian fruit is narrower and more convex. They have five primary ridges and one vitta in each channel. They are surrounded by a pale membranous margin.

The oil is pale yellow, with a pungent odour and an acrid sweetish taste. It resembles oil of caraway, and according to Gladstone it consists of a hydrocarbon, *Anethene*, isomeric with oil of turpentine, and an unoxidised oil ($C_{10}H_{14}O$) identical with *Carvol.*

Sumbul Radix.

The pieces are nearly round, from 2½ to 5 inches in diameter, and from ¾ to 1½ inch thick. They are covered on the outer edge with a dusky-brown rough bark, frequently beset with short bristly fibres. The interior is porous and consists of irregular easily separated fibres. It has a strong musk-like odour. The taste is at first sweetish, becoming after a time bitterish and balsamic. That brought from India differs from the Russian variety in being closer in texture, denser and firmer, and of a reddish tint.

Sumbul root yields about 9 per cent. of a balsamic resin, a little volatile oil, some *Umbelliferone*, about ·75 per cent. of *Angelic acid*, and a trace of *Valerianic acid.* Solution of potash converts the resin into Sumbulic acid, which has a strong odour of musk.

CAPRIFOLIACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
SAMBUCUS NIGRA Elder Flowers (*Indigenous*)	Fresh flowers	Aqua Sambuci	10 lbs. to 1 gal.	1 to 2 ozs.	Used as a cosmetic and vehicle for lotions.

Sambuci Flores.

These are small, white, fragrant, crowded in large five-parted cymes. They yield on distillation a volatile oil which is easily altered by exposure to air; it contains a hydrocarbon, *Sambucene* ($C_{10}H_{16}$), and perhaps a camphor. The active ingredients of Elder flowers are soluble in water.

CINCHONACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
Cinchona Calisaya Yellow Cinchona Cinchona Lancifolia C. Officinalis And other species (also the Remijia bark)	The bark	Quininæ Sulphas	—	1 to 10 grs.	Tonic, antiperiodic, antipyretic, astringent. Given in fevers, malarious diseases, neuralgias, debility, etc. The bark is used in making Mist. Ferri Co.
		Ferri et Quininæ Citras	16 pts. in 100	5 to 10 grs.	
		Tinctura Quininæ	1 gr. in 1 drm.	½ to 2 drms.	
		Tinct. Quininæ Ammoniata	1 gr. in 1 drm.	½ to 2 drms.	
		Vinum Quininæ	1 gr. in 1 oz.	½ to 1 oz.	
		Quininæ Hydrochlor.	—	1 to 10 grs.	
		Cinchonidinæ Sulphas	—	1 to 10 grs.	Same as quinine, but not so powerful.
		Cinchoninæ Sulphas	—	1 to 10 grs.	Same.
Cinchona Succirubra Red Cinchona (*Principally South America*)	The bark	Decoctum Cinchonæ	1 pt. in 16	½ to 2 fl. oz.	Same as above.
		Ext. Cinchonæ Liquid.	1 pt. in 1	5 to 10 mins.	
		Inf. Cinchonæ Acid.	1 pt. in 20	1 to 2 fl. oz.	
		Tinctura Cinchonæ	1 pt. in 5	½ to 2 drms.	
		Tinctura Cinchonæ Co.	1 pt. in 10	½ to 2 drms.	
		Pulv. Cinchonæ Rub.	—	10 to 60 grs.	
Cephaëlis Ipecacuanha Ipecacuanha (*Brazil*)	Dried root	Pulv. Ipecac.	—	Expect., ½ to 2 grs. Emetic, 15 to 20 grs.	Depressing, emetic, expectorant, diaphoretic, antidysenteric. Contained in Pil. Conii Co. (1 in 6.)
		Pil. Ipecac. cum Scillæ	1 pt. in 23 nearly	5 to 10 grs.	
		Pulv. Ipecac. Co.	1 pt. in 10	5 to 15 grs.	
		Troch. Ipecac.	¼ gr. in each	1 to 3	

CINCHONACEÆ (*continued*).

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
		Troch. Morph. et Ipecac.	$\frac{1}{12}$ gr. in each	1 to 6	
		Vinum Ipecac.	22 grs. to 1 oz.	Expect., 5 to 20 mins. Emetic, 3 to 6 drms.	
Uncaria Gambier Pale Catechu (*Singapore*)	Extract from leaves and young shoots	Pulv. Catechu	—	10 to 30 grs.	Astringent in diarrhœa, atonic dyspepsia, hæmorrhages, mucous discharges. As a gargle in hoarseness, etc.
		Infusum Catechu	16 grs. to 1 oz.	1 to 2 ozs.	
		Pulv. Catech. Co.	1 pt. in 2½	20 to 40 grs.	
		Tinct. Catechu	54½ grs. to 1 oz.	½ to 2 drms.	
		Trochisci Catechu	1 gr. in each	—	

Cinchonæ Cortex.

This designation now includes C. calisaya, C. officinalis, C. succirubra, C. lancifolia, and other species from which the peculiar alkaloids of the bark may be obtained. Moreover, salts of quinine and cinchonine may be also obtained from some species of Remijia bark.

All the pharmacopœial preparations of the *bark* are directed to be made with the red cinchona bark.

Cinchona bark was formerly known as "Jesuits' bark," from its extensive sale and distribution by the Jesuits.

The bark varies in its characters and richness in alkaloids according to the part of the plant from which it is taken and the position of the growth of the plant. Cinchona plantations are now successfully cultivated on the Neilgherry hills and in the valleys of the Himalaya. It has been discovered that covering the trunk of the trees with moss for some time increases the yield of alkaloids, and if the trunk be stripped of some of its bark, and the wound covered with moss, new bark will form which is richer in alkaloids than the original bark. According to De Vrij the root-bark of many Cinchonas is richer in alkaloids than the stem-bark.

The true or *Yellow Bark* usually occurs in flat pieces, uncoated or deprived of the periderm, from 6 to 18 inches long, 1 to 3 inches wide, and 2 to 4 lines thick, compact and heavy; outer surface brown, marked by broad, shallow, irregular, longitudinal depressions; inner surface tawny-yellow, fibrous; transverse fracture shortly and finely fibrous. Powder, cinnamon-brown, somewhat aromatic, persistently bitter.

Pale Cinchona bark, known as Crown or Loxa bark, occurs always in single or double quills, from 6 to 15 inches long, 2 to 8 lines in diameter, and from ½ a line to 1 line thick, brittle easily splitting longitudinally, and breaking with a short transverse fracture; outer surface brown and wrinkled, or gray and speckled with adherent lichens, with or without numerous transverse cracks; inner surface bright orange or cinnamon-brown; powder, pale brown, slightly bitter, very astringent.

Red Cinchona Bark occurs in flat incurved pieces, less frequently in quills, coated with the periderm, varying in length from a few inches to 2 feet, from 1 to 3 inches wide, and 2 to 6 lines thick, compact and heavy; outer surface brown or reddish-brown, rarely white, from adhering lichens, rugged or wrinkled longitudinally, frequently warty, and crossed by deep transverse cracks; inner surface redder; fractured surface often approaching to brick-red; transverse fracture finely fibrous; powder, red-brown; taste, bitter and astringent.

The following table, taken from Smith's Commentary, well contrasts the characters of the officinal barks :—

YELLOW.	PALE.	RED.
Usually in flat uncoated pieces.	Always in narrow cylindrical quills.	Usually in flat uncoated pieces; thick and compact.
Outer surface brown; inner, tawny-yellow, fibrous.	Outer surface brown or gray, and speckled with lichens; inner, cinnamon-brown.	Outer surface reddish-brown, frequently warty; inner, redder; fracture, brick-red.
Powder, cinnamon-brown.	Powder, pale-brown.	Powder, red-brown.
Taste, very bitter, slightly astringent.	Taste, slightly bitter, very astringent.	Taste, bitter and astringent.
Infusion is precipitated by sodium sulphate.	Infusion is not precipitated by sodium sulphate.	Infusion is not precipitated by sodium sulphate.
Contains at least 2 per cent. of quinine exclusive of other alkaloids.	Contains at least 0·5 per cent. of alkaloids, *i.e.*, of quinine and cinchonine.	Contains at least 1·5 per cent. of alkaloids, *i.e.*, of quinine and cinchonine.

Besides the above-named officinal barks there are others which are extensively employed for the extraction of alkaloids; the most important of these are Fibrous Carthegena bark, Gray bark, and Remijia bark.

Fibrous Carthegena bark, called also Spongy or Orange Carthegena bark, Bogota, and Coquetta bark is yielded by *Cinchona lancifolia.* It occurs in quills or flat pieces of a yellow or orange colour, often covered on the surface with lichens, and characterised by its spongy or fibrous texture. It yields an abundance of quinidine together with some quinine and cinchona.

Gray bark, called also Silver or Huanuco bark, is yielded by *Cinchona micrantha* and *Cinchona nitida*, the produce of the latter being superior. It occurs in coarse quills, with a grayish epidermis. It is less wrinkled longitudinally and less crooked transversely than pale bark. It yields quinine, cinchonine and cinchonidine.

Those barks contain the largest amount of quinine which, on fracture, show a homogeneous texture with numerous short fusiform fibres scattered uniformly in the cellular tissue. Barks rich in quinine, as a rule, contain much lime, and hence their infusions are precipitated by sodium sulphate, which is not the case with barks yielding cinchonine; gum is most abundant in barks rich in the latter alkaloid.

Quantitative Estimation of the Alkaloids in Bark. (*P. B.*)

1. **For Quinine and Cinchonidine.**—Mix 200 grains (in No. 60 powder) with 60 grains of hydrate of calcium; slightly moisten with half an ounce of water; after standing for an hour or two the mixture will present the characters of a moist, dark-brown powder, in which there should be no lumps or visible white particles. Transfer to a 6-oz. flask, exhaust by boiling and percolation with benzolated amylic alcohol. Introduce the filtrate while warm into a separator; add to it 20 minims of diluted hydrochloric acid with two drachms of water; shake well, and when the acid liquid has separated, this may be drawn off and the process repeated until the whole of the alkaloids have been removed. Exactly neutralise with ammonia while warm, and then concentrate to three fluid drachms. If now about 15 grains of tartarated soda, dissolved in twice its weight of water, be added to the hydrochlorates, insoluble tartrates of quinine and cinchonidine will separate completely in about an hour; these, collected on a filter, washed and dried, contain eight-tenths of their weight of the alkaloids, which, divided by two, represents the percentage of those alkaloids. The other alkaloids will be left in the mother-liquor.

2. For Total Alkaloids.—To the mother-liquor from the preceding process add solution of ammonia in slight excess. Collect, wash, and dry the precipitate, which will collect the other alkaloids. The weight of this precipitate divided by two and added to the percentage weight of the quinine and cinchonidine, gives the percentage of total alkaloids.

The chief constituents of cinchona barks are :—

Alkaloids :—

Quinine	$C_{20}H_{24}N_{2}O_{2}3H_{2}O$
Quinidine	$C_{20}H_{24}N_{2}O_{2}2H_{2}O$
Cinchonine	$C_{20}H_{24}N_{2}O$
Cinchonidine	$C_{20}H_{24}N_{2}O$

Acid principles :—

Quinic or chinic acid	$C_{7}H_{12}O_{6}$
Quino-tannic acid	$C_{14}H_{12}O_{7},H_{2}O$
Quinovin	$C_{30}H_{48}O_{8}$
Quinovic	$C_{20}H_{38}O_{4}$

Quinine.—Exists in largest quantity in Calisaya (yellow) bark. It may be obtained from the sulphate by precipitation with ammonia. When pure it is white and the hydrate is crystallisable, although with some difficulty. It is soluble in about 350 parts of cold water, in 60 parts of ether, and is very soluble in alcohol, chloroform, and in fixed and volatile oils. When heated, it fuses into a resinoid mass. It forms crystallisable salts with acids, and solutions of these in excess of the acid pass into a resinoid condition on exposure to sunlight; these solutions are very bitter, and yield a precipitate with tincture of galls, with gallic, tartaric, and oxalic acids, and with mercuric and argentic nitrates. Solutions of quinine exhibit a blue fluorescent appearance; and when treated with fresh strong chlorine-water and ammonia a dark emerald-green colour (*Thalleioquin*) is produced.

With sulphuric acid quinine forms three sulphates:—1. The normal or pharmacopœial sulphate $(C_{20}H_{24}N_2O_2)_2H_2SO_4 + 8H_2O$ (p. 224), which is sparingly soluble in water; 2. The acid or soluble sulphate $(C_{20}H_{24}N_2O_2,H_2SO_4 + 7H_2O)$, formed by adding a little dilute sulphuric acid to the officinal sulphate; and, 3. A di-acid sulphate $(C_{20}H_{24}N_2O_2,2H_2SO_4 + 7H_2O)$.

Cinchonine.—Contained chiefly in pale bark. It crystallises from its alcoholic solution in four-sided prisms. It is soluble in about 120 parts of alcohol; is much less soluble in ether, and almost insoluble in water; solutions of the alkalies and alkaline bicarbonates readily dissolve it. With acids it forms soluble salts which have an intensely bitter taste. Solutions of the latter are not fluorescent, and do not give a green coloration with chlorine-water and ammonia; they are precipitated by infusion of galls, and by gallic, tartaric, and oxalic acids.

Quinidine.—Is contained in many barks, especially those of New Granada. When pure, occurs in white prisms. It is less soluble in water and in ether than quinine; its sulphate is more soluble than that of quinine and less so than that of cinchonine. Solutions of quinidine are fluorescent, and when treated with chlorine-water and ammonia give an emerald-green colour.

Cinchonidine.—Occurs in striated rhomboidal prisms; forms crystallisable salts; is almost insoluble in ether. Solutions of it are not fluorescent, nor do they give the green coloration on being treated with chlorine and ammonia.

According to Pasteur, quinine and quinidine when carefully heated in the form of a salt, as the tartrate, are changed into an isomeric and similar but amorphous body, *Quinicine;* cinchonine and cinchonidine under like circumstances are converted into an isomeric substance, *Cinchonicine.*

Quinine and cinchonidine turn a plane of polarised light to the left; cinchonine and quinidine turn it to the right.

The substance termed *Quinoidine* consists of resinous and colouring matters with the cinchona alkaloids changed to a certain extent; it is obtained from the liquors from which sulphate of quinine has been crystallised.

Quinic Acid.—Crystallises in oblique rhombic prisms resembling tartaric acid in appearance; it is soluble in water, less so in alcohol, and sparingly soluble in ether; when distilled with some oxidising agents it yields a yellow, crystallisable, pungent sublimate, *Quinone* ($C_6H_4O_2$). By destructive distillation it yields benzol, benzoic acid, salicylic acid, carbonic anhydride, and *hydro-quinone* ($C_6H_6O_2$).

Quino-tannic Acid.—Differs from ordinary tannic acid in giving a green precipitate with persalts of iron. It is very soluble in water, alcohol, and ether. On destructive distillation it yields *Pyro-catechin.* It is decomposed by alkalies, *Cincho-fulvic acid* being precipitated.

Quinovin.—Is an amorphous substance; almost insoluble in water, but soluble in ether and alcohol. By hydrochloric acid it is decomposed into *Quinovic acid* and *Quinova* sugar.

Quinovic Acid.—A feeble acid; insoluble in water, and sparingly soluble in alcohol, ether, or chloroform.

Besides the acids and alkaloids above mentioned the cinchona barks also contain tannin, starch, colouring matter, a thick volatile oil, a concrete fat gum, ligneous fibre, etc.

Quininæ Sulphas.

Occurs in filiform silky snow-white crystals, of a pure intensely bitter taste, sparingly soluble in cold water (1 in 740), yet imparting to it a peculiar bluish tint. The solution gives with chloride of barium a white precipitate ($BaSO_4$) insoluble in nitric acid, and when treated first with solution of chlorine and afterwards with ammonia it becomes of a splendid emerald-green colour. Dissolves in pure sulphuric acid with a feeble yellowish tint, and undergoes no further change of colour when gently warmed (*vide infra*, Salicine). Ten grains with 10 minims of diluted sulphuric acid and half a fluid ounce of water form a perfect solution, from which ammonia throws down a white precipitate (quinina). This redissolves on agitating the whole with half a fluid ounce of pure ether, without the production of any crystalline matter floating on the lower of the two strata into which the agitated fluid separates on rest. Crystals, if present, consist of quinidine, which is very slightly soluble in ether. Twenty-five grains of the salt should lose 3·6 grains of water by drying at 212°.

ADULTERATIONS.—(*a*) *Sulphate of lime*, *Chalk*, and *Magnesia;* these are insoluble in alcohol, and when heated on platinum foil leave an ash, the nature of which is ascertained by the ordinary tests.

(*b*) *Cinchonine*, *Cinchonidine*, and *Quinidine;* detected by their different solubilities in water, alcohol, and ether.

(*c*) *Salicine;* gives a blood-red colour with sulphuric acid.

(*d*) *Sugars;* solution of the salt, after precipitation of the alkaloid by an alkali, is sweet.

(*e*) *Starch;* gives a blue colour with iodine.

(*f*) *Stearic acid;* is insoluble in dilute acids.

(*g*) *Boracic acid;* alcoholic solution burns with a green flame.

Quininæ Hydrochloras.

In crystals resembling those of sulphate of quinine, but generally somewhat larger. It is soluble in about 34 parts of water, or about 3 parts of spirit at the ordinary temperature. Its solution yields a green colour when treated with chlorine water and then with ammonia; with chloride of barium it gives only a faint turbidity; and with nitrate of silver a white precipitate insoluble in nitric acid. It may be converted into sulphate of quinine by dissolving it together with an equal weight of sulphate of sodium in ten times its weight of distilled water, and setting the mixture aside at 60° F. for half an hour. Such sulphate should respond to the characters and tests that are mentioned under "Quininæ Sulphas." Dried at a temperature of 212° F., it loses 9 per cent. of water.

Cinchonidinæ Sulphas.

In colourless silky crystals, usually acicular. Soluble in water, alcohol or ether; almost insoluble in chloroform or in solution of ammonia. The solution in water has a bitter taste and a neutral or faintly alkaline reaction, and deviates a ray of polarised light to the left. When acidified the solution is not distinctly fluorescent, and gives a white precipitate with chloride of barium. It gives a white precipitate with solution of tartarated soda, and in the filtrate from this mixture solution of ammonia occasions not more than a slight turbidity. It dissolves in pure sulphuric acid with production of not more than a faint yellow coloration, and the fluid undergoes no apparent change when gently warmed. Twenty-five grains of the salt lose 1·76 grain of moisture on drying at 212° F.—when ignited in the air no ash remains.

Cinchoninæ Sulphas.

Hard, colourless, short, prismatic crystals, with a vitreous lustre. Soluble in water and chloroform, almost insoluble in ether and in solution of ammonia, readily soluble in rectified spirit and in diluted acids. The aqueous solution has a bitter taste, a neutral or faintly alkaline reaction, and deviates a ray of polarised light to the right; its acidified solution is not fluorescent, and gives a white precipitate with chloride of barium. It dissolves in pure sulphuric acid without change of colour, and the fluid undergoes no apparent change when gently warmed. Twenty-five grains of the salt should lose 1·26 grain of moisture when dried at 212° F., and should then almost wholly dissolve in four ounces by weight of chloroform. When ignited in air no ash remains.

Ipecacuanha.

The Officinal, or Annulated, or Brazilian root occurs in pieces three or four inches long, about the size of small quills, contorted and irregularly annulated. Colour, brown of various shades. It consists of two parts—the cortical or active portion, which forms about 75 to 80 per cent. of the root, and a slender, tough, almost inert meditullium or woody centre. The powder of ipecacuanha is pale-brown, with a faint nauseous odour, and a somewhat acrid bitter, disagreeable taste, which, according to Dr. Paris, is covered by powdered gum arabic.

Striated or Peruvian Ipecacuanha is the produce of *Psychotria emetica*, N. O. Rubiaceæ, and is occasionally mixed with or substituted for the officinal root; it is of a dark colour and is wrinkled longitudinally. Undulated amylaceous ipecacuanha, yielded by various species of *Richardsonia*, N. O. Rubiaceæ, and also white Brazilian ipecacuanha derived from certain species of *Ionidium*, N. O. Violaceæ, have also been imported and confounded with the true root.

The powder of ipecacuanha is sometimes adulterated with almond-meal, and the imposition is detected by the development of the odour of prussic acid on moistening the powder with water and placing it in a warm place for half an hour.

Ipecacuanha contains about 1 *per cent.* of a feeble alkaloid, *Emetine* ($C_{30}H_{44}N_2O_4$), united with *Cephaëlic* or *Ipecacuanic acid;* the former is a whitish amorphous powder with a bitter taste, is soluble in alcohol and sparingly so in water and ether; it is precipitated by tannin; its nitrate is remarkable for its insolubility in water. Cephaëlic acid is a glucoside, and occurs as an amorphous reddish-brown powder; it is allied to *Catechin*, strikes green with persalts of iron, and was formerly thought to be gallic acid. Ipecacuanha root also contains starch, sugar, gum, pectin, albumen, and fatty or oily matter.

Catechu Pallidum.

From its earthy appearance was formerly called Terra Japonica; its native name is *gambir*. It is met with in cubes, or masses formed of coherent cubes; the former are about an inch in diameter, externally brown, internally ochrey-yellow or pale brick-red, of a porous texture, breaking easily with a dull earthy fracture. Sp. gr. 1·390. Taste bitter, very astringent and mucilaginous, and succeeded by slight sweetness; its astringency is destroyed by alkalies. It is mostly soluble in cold and entirely soluble in boiling water. A decoction of it when cool is not rendered blue by iodine, showing absence of starchy impurities.

Varieties of catechu are yielded by the Acacia catechu (black catechu or cutch), Areca catechu, or Betel-nut, etc.

Catechu consists chiefly of a variety of tannic acid termed *Catechu-tannic* or *Mimotannic acid*, and *Catechin* or *Catechuic acid* ($C_{13}H_{12}O_5$). The former is soluble in cold water, and, unlike *Gallo-tannic acid*, gives a green precipitate with persalts of iron, does not precipitate tartar emetic, and does not yield pyrogallic acid on heating; on exposure in the moist state it absorbs oxygen, becomes dark red, and is rendered insoluble in water.

Catechin crystallises in colourless needles; it is nearly insoluble in cold water, but is soluble in boiling water, alcohol, and ether; its solutions do not precipitate gelatine or vegetable alkaloids except after prolonged boiling, by which it is converted into *Catechu-tannic acid ;* it strikes green with persalts of iron ; by alkalies and alkaline carbonates it is converted into *Japonic* and *Rubinic* acids.

Besides the constituents above named, catechu also contains extractive matter, mucilage, and certain insoluble compounds.

VALERIANACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
VALERIANA OFFICINALIS Valerian (*Britain*)	The dried root	Pulv. Valerianæ	—	10 to 30 grs.	Stimulant, antispasmodic. Given chiefly in hysterical affections.
		Infusum Valerianæ	240 grs. to 1 pnt.	1 to 2 ozs.	
		Tinctura Valerianæ	2½ ozs. to 1 pnt.	1 to 2 drms.	
		Tinct. Valerian. Ammoniata	2½ ozs. to 1 pnt.	½ to 1 drm.	

Valerianæ Radix.

A short yellowish-white rhizome with numerous fibrous roots about two or three inches long; of a bitter camphoraceous taste and penetrating odour, which is agreeable in the recent root but becomes fœtid by keeping. It yields from ½ to 2 per cent. of *Volatile oil*, and about 5 per cent. of *Valerianic acid* when distilled with water; it contains also resinous, extractive, and gummy matters, a little sugar, malic acid, etc.

The volatile oil is greenish and possesses the odour of valerian. Sp. gr. 6·94. It consists of a camphor or stearoptene ($C_{10}H_{18}$) identical with *Borneol*, the hydrocarbon found in Borneo camphor; of *Valerole* ($C_6H_{10}O$), and *Borneene* or *Valerene* ($C_{10}H_{16}$), which resembles oil of turpentine. *Borneol*, the camphor of Dryobalanops camphora, is a constituent of oil of hops, is crystalline at a low temperature, and forms a blood-red solution with sulphuric acid. On exposure it absorbs oxygen and is converted into valerianic acid, a change which is instantly effected by caustic potash.

Valerianic acid ($HC_5H_9O_2$) can be obtained by distilling the root with sulphuric acid, and also by oxidation of amylic alcohol; it is an oily liquid with a powerful odour of valerian. Sp. gr. 0·9. It forms with bases salts, of which the valerianates of sodium and of zinc are officinal.

COMPOSITÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
Anacyclus Pyrethrum Pellitory (*The Levant*)	Root	Tinct. Pyrethri	4 ozs. to 1 pnt.	—	Topical irritant, sialagogue. Used in odontalgia, relaxed throat, aphonia, etc.
Artemisia Maritima (*Russia*)	Unexpanded flower-heads	Santonica (Pulv.) Santoninum Trochisci Santonini	— — 1 gr. in each	10 to 60 grs. 2 to 6 grs. 1 to 6	Anthelmintic in cases of round and thread worms.
Anthemis Nobilis Chamomile (*England*)	The dried single and double flowers	Inf. Anthemidis Extract. Anthemidis Oleum Anthemidis	½ oz. to 10 ozs. — —	1 to 4 ozs. 2 to 10 grs. —	Aromatic bitter and tonic. In large doses emetic. Prescribed in atonic dyspepsia and as an adjunct to purgatives and emetics.
Taraxacum Officinale Dandelion (*Britain*)	*a.* The fresh root *b.* The dried root	Extr. Taraxaci Succus Taraxaci Decoct. Taraxaci Extr. Taraxaci Liquidum	— — 1 oz. to 1 pnt. —	5 to 30 grs. 1 to 2 drms. 2 to 4 ozs. ¼ to 2 drms.	Cholagogue; tonic. Sometimes diuretic. Given in hepatic congestion.
Lactuca Virosa Wild Lettuce (*Britain*)	The flowering herb	Extr. Lactucæ	—	5 to 15 grs.	Soporific; sedative. Relieves cough.
Arnica Montana Arnica (*Middle and Southern Europe*)	The dried rhizome and rootlets	Tinctura Arnicæ	1 oz. to 1 pnt.	1 to 2 drms.	Stimulant to nervous system. Given in adynamia, chronic rheumatism, etc. Externally applied to bruises, sprains, etc.

Pyrethri Radix.

In pieces about the length and thickness of the little finger, covered with a thick brown bark, studded with black shining spots ; breaks with a resinous fracture, and presents internally a radiated structure. When chewed, it excites a prickling sensation in the lips and tongue, and a glowing heat. It contains two resins—one, *Pyrethrin* or *Pyrethric acid*, insoluble in solution of caustic potash, the other soluble—as well as a yellow acrid oil, together with inulin, gum, tannin, colouring matter, salts, ligneous fibre, etc. The root of African Pellitory, Anacylus officinarum, has been substituted for it.

Santonica.

Consists of minute unexpanded flower-heads, which are rather more than a line in length, and nearly half a line in breadth, fusiform, blunt at each end, resembling seeds in appearance, whence its common name "wormseed," but formed of imbricated involucral scales with a green midrib, enclosing four or five tubular flowers. The odour is strong, and the taste bitter and camphoraceous. The fact that the flower-heads are not round and hairy shows non-admixture with flowers of Artemisia vulgaris or of A. Absinthium.

Besides resin, fat, sugar, etc., santonica yields about 1 per cent. of a *volatile oil*, which consists chiefly of *Cinœbene camphor* ($C_{10}H_{18}O$) ; it boils at 347°, and on heating becomes converted into the dehydrated condition ($C_{10}H_{16}$). The most important constituent of santonica is *Santonin*, which it contains in the proportion of 1½ to 2 per cent. *Santonin* ($C_{15}H_{18}O_3$) is a crystalline neutral principle, occurring in colourless flat rhombic prisms, odourless, with a feebly bitter taste, fusible and sublimable by a moderate heat, but entirely destructible by a red heat with free access of air. It is scarcely soluble in cold water, sparingly soluble in boiling water, but very soluble in chloroform and boiling rectified spirit. It is insoluble in diluted mineral acids, but soluble in solutions of caustic fixed alkalies, forming santonates with them. Sunlight renders santonin yellow, owing to an alteration in its crystalline form. According to Hesse, santonin is the anhydride of *Santoninic acid* ($C_{15}H_{20}O_4$). Heated with alkalies, it is converted into *Santonic acid*, which is isomeric with santoninic acid, but, unlike the latter, is not converted by heat into santonin and water. Prolonged boiling in dilute nitric acid converts santonin into *Succinic acid*. Santonin has been adulterated with gum and with boracic acid; the former is detected by its solubility in water, the latter by its alcoholic solution burning with a green flame.

Anthemidis Flores.

This plant has a strong pleasant odour, and a bitter, slightly aromatic taste; the flower-heads resemble those of the daisy. The simple variety, "Scotch chamomile," consists of both yellow tubular and white strap-shaped florets. The double variety, "English chamomile," consists of white strap-shaped florets only, all arising from a conical scaly receptacle. Both varieties, but especially the single, are bitter, and very aromatic. By cultivation the single flower-heads are often changed into the double variety. The aromatic qualities of chamomile are due to a *volatile oil* which resides chiefly in the yellow tubular florets; the single flower-heads are therefore preferable. The oil is pale-blue or greenish, becoming yellowish by age. Sp. gr. 0·91. It is regarded by Demarçay as a mixture of *Butylic and amylic angelate and valerate.* When heated with caustic potash, it yields potassic angelate, from which the *Angelic acid* ($HC_5H_7O_2$) may be separated by dilute sulphuric acid. Chamomile also yields a *bitter extractive principle*, soluble in water and alcohol, together with a minute quantity of tannin. Flower-heads of Chrysanthemum Parthenium have been substituted for those of chamomile, but they are distinguished by the flat or nearly convex receptacle; flower-heads of Matricaria chamomilla may be recognised by the naked and hollow receptacle.

Taraxaci Radix.

Tap-shaped roots, smooth and dark-brown externally, white within, easily broken, and giving out an inodorous, bitter, milky juice, which becomes brown on exposure, acquires an acid reaction, and, according to Messrs. T. and H. Smith, develops a large quantity of *Mannite.* Taraxacum root should not be wrinkled or pale-coloured externally, and any adherent leaves are runcinate and quite smooth. By this latter character the root of dandelion is distinguished from that of the common hawkbit, Leontodon hispidas. The juice is most abundant in the autumn and winter, and the root should then be collected ; in the spring the juice is thin and watery. The juice contains resinous matters, malin, lævulose, sugar, gum, and a bitter extractive from which a crystalline principle, *Taraxacine,* has been obtained. This is soluble in alcohol, ether, and boiling water, but sparingly soluble in cold water. According to Marme, the leaves and stalk of the plant yield *Inosite* ($C_6H_{12}O_62H_2O$) or muscle-sugar.

Lactuca.

The officinal plant, distinguished by its rank odour and red-spotted stem, is preferable to the garden lettuce, in consequence of its yielding a larger quantity of *Lactucarium.* This, the concrete juice of the plant, is obtained by pressing out the juice from the flowering herb, and afterwards inspissating it with a gentle heat. It is met with in small brown lumps, with an opium-like odour and a bitter taste. It is also known as *lettuce-opium* or *thridace.* To alcohol it yields a bitter extractive, and a crystalline substance, *Lactucone,* which is soluble in alcohol and ether, but not in water; it also yields *Lactucic acid* and *Lactucin*, which are soluble in water; the latter substance is crystalline, and resembles mannite. Besides these, Lactucarium contains resin, albumen, sugar, asparagin, succinic and other acids, and some salts.

Arnicæ Rhizoma.

The rhizome is from two to three inches long, and from two to three lines thick, cylindrical, contorted, rough from the scars of the coriaceous leaves, and furnished with numerous long, slender fibres; it has a peppery taste, and a peculiar aromatic odour. It contains a bitter resinous principle, *Arnicin* ($C_{20}H_{30}O_4$), which is an amorphous yellow substance, slightly soluble in water, but freely soluble in alcohol, ether, and alkaline solutions. *Trimethylamine* and a yellowish volatile oil (C_9H_9O) have also been obtained from it. The roots of Geum urbanum, N.O. Rosaceæ, which have been used to adulterate arnica, are distinguished from its rhizomes by their astringency and want of acridity.

LOBELIACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
LOBELIA INFLATA Lobelia Indian Tobacco (*North America*)	The dried flowering herb	Tinct. Lobeliæ	54½ grs. to 1 oz.	10 mins. to ½ drm.	Antispasmodic, expectorant, diaphoretic, and emetic. Given in spasmodic asthma.
		Tinct. Lobeliæ Ætherea	54½ grs. to 1 oz.	10 mins. to ½ drm.	

Lobelia.

Stem angular; leaves alternate, ovate, toothed, somewhat hairy beneath; capsules ovoid, inflated, ten-ribbed; herb acrid. Usually met with in compressed rectangular parcels, somewhat resembling chopped hay. Has a peculiar odour, and a burning taste, which, however, is not observed for some time after it has been chewed. It contains a volatile oil, *Lobelic acid*, and an alkaline active principle, *Lobelina.*

This is a yellowish volatile liquid, lighter than water, with a tobacco-like odour; it is soluble in ether and alcohol; forms salts with mineral acids, but is decomposed by alkalies.

ERICACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
ARCTOSTAPHYLOS UVA-URSI Bearberry (*Indigenous*)	Dried leaves	Infusum Uvæ Ursi	1 oz. to 1 pnt.	1 to 2 ozs.	Astringent, diuretic. In irritation of mucous membrane of bladder and urethra.

Uvæ Ursi Folia.

Obovate, entire, dark-green, shining, about three-fourths of an inch long, reticulated beneath, with a strong astringent taste, by which they may be distinguished from Box-leaves, and a feeble hay-like odour when powdered. The leaves are not dotted beneath, nor toothed on the margin, in this respect differing from the leaves of the Red Whortleberry, Vaccinium Vitis-Idæa. The infusion gives a bluish-black precipitate, with perchloride of iron, showing the presence of gallic and tannic acids, about 36 per cent. of the latter being contained in the leaves; they also contain two crystallisable principles, Arbutin ($C_{25}H_{34}O_{14},H_2O$) and Ericolin ($C_{34}H_{56}O_{21}$), with bitter extractive, etc.

SAPOTACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
DICHOPSIS GUTTA Gutta-percha (*Borneo, Sumatra, etc.*)	Concrete juice	Liquor Gutta-percha	—	—	Gutta-percha is used for making splints, etc. The liquor as a protective, and in the preparation of Charta Sinapis.

Gutta-Percha.

Occurs in tough, flexible pieces, of a light brown or chocolate colour, soluble, or nearly so, in chloroform, yielding a more or less turbid solution; it is soluble also in ether, disulphide of carbon, benzol, and volatile oils, but insoluble in water, alkaline solutions, dilute acids or fixed oils. Becomes soft and plastic at 212°, and on cooling retains the form that has been given to it when soft. It becomes negatively electric when rubbed, and is an insulator of electricity. The commercial variety consists of about 80 per cent. of pure *Gutta* ($C_{20}H_{32}$), a milk-white solid, and the remainder is composed of two resins—one crystalline ($C_{20}H_{32}O_2$), the other amorphous ($C_{20}H_{32}O$). Pure gutta-percha slowly absorbs oxygen on exposure, and is gradually converted into a brittle resin, devoid of plasticity; it may be preserved under water or in the dark without change for an indefinite period.

STYRACACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
STYRAX BENZOIN Benzoin (*Siam and Sumatra*)	Balsamic resin flowing from incised bark	Acid. Benzoicum	—	10 to 15 grs.	Expectorant in chronic bronchitis. Antiseptic. Tincture externally applied to ulcers, wounds, etc.
		Adeps Benzoatus	10 grs. to 1 oz.	—	
		Tinct. Benzoin. Co.	44 grs. to 1 oz.	½ to 1 drm.	
		Unguent. Cetacei	—	—	

Benzoinum.

Siam benzoin occurs in lumps consisting of agglutinated tears or of a brownish mottled mass with or without white tears embedded in it; an inferior variety known as Calcutta benzoin, which is much darker in colour, has been met with. Benzoin has little taste, but an agreeable odour; it gives off, when heated, fumes of benzoic acid; being chiefly a resin, it is soluble in rectified spirit, and it is soluble also in solution of potash and in lime water, forming soluble benzoates with its acid. It contains from 10 to 20 per cent. of benzoic acid (*vide* Acida), the remainder consisting of a resin which is partly soluble in ether. Some samples of it yield *Cinnamic acid.* Treated with sulphuric acid, benzoin acquires a maroon-red colour.

OLEACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
OLEA EUROPÆA European Olive (*Southern Europe*)	Ripe fruit	Oleum Olivæ	—	—	Demulcent. In large doses slightly laxative. Contained in Charta Epipastica, Cataplasma Lini, Enema Magnesii Sulph., and in several Emplastra, Linimenta, and Unguenta.
FRAXINUS ORNUS FRAXINUS ROTUNDIFOLIA Manna (*Calabria and Sicily*)	Concrete saccharine exudation from the stem	Manna	—	60 grs. to 1 oz.	Mild laxative. Used in constipation in children. Adjunct to purgatives.

Oleum Olivæ.

The olive fruit is a smooth, elliptical, single-seeded drupe, about three-fourths of an inch long, and half an inch in diameter, green at first, but afterwards violet-coloured. The oil, called also "sweet oil" or "salad oil," is pale yellow, almost odourless, with a bland mucilaginous taste. Sp. gr. 0·92. It partially congeals at about 36°. It consists of about 72 per cent. of a fluid portion, *Oleine* or *Oleate of glyceryl*, $C_3H_53C_{18}H_{33}O_2$, and 28 per cent. of a solid portion, formerly termed *Margarine*, which is a mixture of *Palmitine*, $C_3H_53C_{16}H_{31}O_2$, and *Stearine*, $C_3H_53C_{18}H_{35}O_2$. It unites with alkalies and other bases, forming soaps. Nitrate of mercury and yellow nitric acid convert it into a solid compound, *Elaidine.*

Glycerine may be separated from ordinary animal or vegetable fixed oils and fats, except spermaceti and wax, by saponification or distillation with superheated steam. It is a slightly yellow or colourless syrupy-looking liquid; sp. gr. 1·260; very sweet, oily to the touch, mixes readily with water and alcohol, but is insoluble in pure ether and chloroform; the watery solution does not ferment with yeast. At the ordinary temperature glycerine does not evaporate, but absorbs moisture on exposure. Glycerine is a triatomic alcohol, a hydrate of glyceryl, having the formula C_3H_53HO or $\left.\begin{matrix}C_3H_5\\H_3\end{matrix}\right\}O_3$. By replacement of three of its atoms of hydrogen by the radicles of the fatty acids, it forms fats and oils. When decomposed by heat it gives off irritating vapours of *Acrolein* (C_3H_4O); at a red heat it takes fire, and burns with a blue flame. Glycerine possesses remarkable solvent powers, arsenious acid, carbolic acid, borax, many alkaloids, etc., being freely soluble in it; heated with starch it forms a plasma; some bodies, as bichromate and permanganate of potassium, are decomposed by it. It cannot be distilled without decomposition, except in the presence of steam, or in a partial vacuum. Acted on by strong nitric acid, it yields *Nitro-glycerine,* $C_3H_5(NO_2)_3O_3$, an explosive, poisonous, oily liquid. Glycerine possesses marked antiseptic properties. It is liable to contain several impurities. If it be diluted with water, its specific gravity will be lower than that stated above; if rancid oils be present, a drop of it rubbed on the hand will develop an unpleasant odour; if glucose be present, it will be turned brown with caustic potash, and when heated with strong sulphuric acid will give off gases. The presence of gum, dextrin, or glue would cause it to become turbid on mixture with four volumes of alcohol; it will redden litmus if acids be present; the presence of formic acid would be shown by its reducing ammonio-nitrate of silver, and the development of a pine-apple odour, when warmed gently with a little alcohol and strong sulphuric acid, indicates the presence of butyric acid.

Sapo Durus, "Hard soap," is formed by combination of olive oil and *soda*. It is composed of oleate and palmitate of sodium. It is grayish-white, horny, easily powdered when kept in dry air, and easily moulded when heated. The presence of a little oxide of iron gives it a red or blue marbled appearance. It is soluble in water, and the solution is precipitated by lime, lead, etc. The ash left after incineration does not deliquesce; it should be entirely soluble in rectified spirit (absence of insoluble ingredients), and should not give an oily stain to paper (absence of unsaponified oil).

Sapo Mollis, "Soft soap," is formed by combination of olive oil and *potash*. It is a yellowish-green, transparent, and gelatinous substance, composed of oleate and palmitate of potassium. The ash left after incineration is very deliquescent, showing that potash, not soda, has been employed in its manufacture. Like hard soap, it should be entirely soluble in rectified spirit, and should not impart an oily stain to paper.

Manna.

The best manna, or "flake manna," is met with in stalactiform pieces from 1 to 6 inches in length and 1 or 2 inches in width, uneven, porous, and friable, curved on one side, of a yellowish white colour, with a faintly nauseous odour and a sweetish but rather bitter taste. It is soluble in five parts of water and is soluble also in alcohol. Inferior manna is soft and light brown. Manna consists of from 60 to 80 per cent. of *Mannite* ($C_6H_{14}O_6$) together with common sugar and extractive matter; the glaucous colour of manna is due to *Fraxin* ($C_{16}H_{18}O_{10}$), which resembles *Æsculin,* and like it forms fluorescent solutions. The mannite may be extracted by means of boiling rectified spirit; it separates on cooling in colourless, shining, four-sided crystals. Mannite requires five parts of cold water for its solution, and this does not undergo vinous fermentation in contact with yeast; nitric acid converts it into saccharine and oxalic acids. Mannite is widely distributed through the vegetable kingdom.

LOGANIACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
STRYCHNOS NUX VOMICA Nux Vomica (*East Indies*)	The seeds	Extract. Nucis Vomicæ	—	$\frac{1}{4}$ to 1 gr.	Increases reflex excitability of the spinal cord. Nerve tonic. Useful in some cases of chronic paralysis.
		Tinct. NucisVom.	133 grs. to 1 pnt.	10 to 20 mins.	
		Strychnina	—	$\frac{1}{30}$ to $\frac{1}{12}$ gr.	
		Liq. Strychninæ Hydrochloratis	1 in 100	5 to 10 mins.	
GELSEMIUM NITIDIUM (Gelsemium Sempervirens) Yellow Jasmine (*North America*)	The dried rhizome and rootlets	Pulv. Gelsemii	—	5 to 30 grs.	Acts on the spinal cord, causing first sensory, then motor paralysis. Is used in various forms of neuralgia, rheumatism and muscular spasm as a sedative.
		Extract. Gelsemii Alcoholicum	—	$\frac{1}{2}$ to 2 grs.	
		Tinctura Gelsemii	$2\frac{1}{2}$ ozs. to 1 pnt.	5 to 20 mins.	

Nux Vomica.

The fruit is an orange-like berry, filled when ripe with a jelly-like pulp which contains the seeds; these are nearly circular and flat, about an inch in diameter, umbilicated and slightly convex on one side, externally of an ash-gray colour, thickly covered with short satiny hairs; internally translucent, tough and horny, taste intensely bitter, inodorous. Nux vomica seeds are very difficult to pulverise and must previously be well steamed and rapidly dried.

Nux vomica contains three alkaloids, *Strychnine* ($C_{21}H_{22}N_2O_2$), *Brucine* ($C_{23}H_{26}N_2O_4$), and *Igasurine* united with *Igasuric* or *Strychnic acid.*

Strychnina crystallises in right square octahedrons or prisms, colourless and inodorous ; sparingly soluble in water, but communicating to it its intensely bitter taste ; soluble in boiling rectified spirit and in chloroform, but not in absolute alcohol or in ether. It forms crystallisable salts with acids. Pure sulphuric acid forms with it a colourless solution, which on the addition of bichromate of potassium, or other oxidising agents, acquires an intensely violet hue, speedily passing through red to yellow. Not coloured by nitric acid, showing the absence of brucine ; leaves no ash when burned with free access of air.

Brucine crystallises with four equivalents of water ; it is much more soluble in water than strychnine, and is soluble in alcohol. It forms salts with acids; and with nitric acid is coloured red, turning to violet on the addition of stannous chloride.

Igasuric acid is crystallisable ; its solution precipitates copper salts bright green.

The bark of Nux vomica, known as false Angustura bark, has been used to adulterate Cusparia, or the true Angustura bark.

Gelsemium.

The rhizome is nearly cylindrical, from half an inch to six inches or more in length, with small rootlets attached to or mixed with the larger pieces ; light yellowish-brown externally, and marked longitudinally by dark purple lines, fracture splintery ; bark thin, with silky fibres in its liber, closely attached to a pale yellow, porous, woody axis with evident medullary rays and with or without pith. Odour aromatic; taste bitter.

The active properties of the root are due to an alkaloid *gelsemine*, found in combination with *gelseminic acid.* It is a colourless, amorphous solid, intensely bitter, with strong basic properties. The root also contains a *resin* devoid of specific properties.

ASCLEPIADACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
HEMIDESMUS INDICUS Hemidesmus, or Indian Sarsaparilla (*India*)	The dried root	Syrupus Hemidesmi	1 oz. to 10½ ozs.	1 drm.	Alterative, tonic, diaphoretic, diuretic. An agreeable flavouring agent.

Hemidesmi Radix.

Yellowish-brown, cylindrical, tortuous, furrowed, and with annular cracks, having a fragrant odour resembling that of the Tonquin bean, and a very agreeable but rather bitter flavour. It yields its active properties to boiling water, and contains a volatile crystallisable acid substance, *Hemidesmic acid.*

GENTIANACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
GENTIANA LUTEA Yellow Gentian (*Pyrenees*)	Dried root	Extr. Gentianæ Infus. Gentian. Co. Tinct. Gentian. Co.	— 110 grs. to 1 pnt. 1½ ozs. to 1 pnt.	2 to 10 grs. 1 to 2 ozs. ½ to 2 drms.	Bitter or stomachic tonic. Given in atonic dyspepsia.
OPHELIA CHIRATA Chiretta (*Northern India*)	Entire plant	Infus. Chiratæ Tinct. Chiratæ	½ oz. to 1 pnt. 2½ ozs. to 1 pnt.	1 to 2 ozs. ½ to 2 drms.	Pure bitter tonic. Given in atonic dyspepsia.

Gentianæ Radix.

From half an inch to one inch thick, several inches in length, often twisted, much wrinkled or marked with close transverse rings, brownish externally, yellow within, tough and spongy; taste at first sweetish, afterwards very bitter. Gentian root contains a crystalline, tasteless, inert acid, *Gentianic* ($C_{14}H_{10}O_5$), and a crystalline bitter substance, *Gentio-picrin* ($C_{20}H_{30}O_{12}$). By boiling with dilute acids the latter is converted into glucose and a neutral amorphous substance, *Gentio-genin.* Gentian root also contains sugar, gum, pectin, a little volatile oil, and fat. It does not contain starch or tannic acid.

Chirata.

Stems about three feet long, of the thickness of a goose-quill, round, smooth, pale brown, branched; branches opposite; flowers small, numerous, panicled; the whole plant is intensely bitter. It contains *Ophelic acid* ($C_{13}H_{20}O_{10}$) and a bitter resinous substance, *Chiratin* ($C_{26}H_{48}O_{15}$); this latter may be precipitated by tannic acid.

CONVOLVULACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
CONVOLVULUS SCAMMONIA Scammony (*Syria and Asia Minor*)	*a.* The dried root	Scammonium	—	—	Source of the resin and gum-resin.
		Scammoniæ Resina	—	3 to 8 grs.	
	b. The gum-resin	Scammoniæ Resina	—	—	Drastic purgative like the resin, which may also be prepared from the gum-resin.
		Mist. Scammoniæ	3 grs. to 1 oz.	1 to 3 fl. ozs.	
	c. The resin	Conf. Scammoniæ	1 pt. in 3	10 to 30 grs.	Drastic purgative. Contained in Ext. and Pil. Colocynth Co.
		Pulv. Scam. Co.	1 pt. in 2	10 to 20 grs.	
		Pil. Scam. Co.	1 pt. in 3	5 to 15 grs.	
IPOMŒA PURGA Jalap (*Mexico*)	Dried tubercles	Pulv. Jalapæ	—	10 to 30 grs.	Drastic and hydragogue cathartic. Useful purgative in ascites and general dropsies. Contained in Pil. Scammon Co.
		Extract. Jalapæ	—	5 to 15 grs.	
		Pulv. Jalap. Co.	1 pt. in 3	20 to 60 grs.	
		Resina Jalapæ	—	2 to 5 grs.	
		Tinctura Jalapæ	54½ grs. to 1 oz.	½ to 2 drms.	

Scammoniæ Radix, Scammoniæ Resina, Scammonium.

The root is tap-shaped, sometimes three inches in diameter at the top, brown without, white within, slightly odorous, but tasteless, tough and resinous. Ether agitated with the powder, and evaporated, leaves a residue having the properties of scammony resin. One hundred parts of the root contain 4·12 of resin, 5·8 of gum, 24·48 of sugar, starch, and extractive, the remainder being cellulin and starch.

Scammony Resin is obtained by exhausting the root or gum-resin with warm rectified spirit, and precipitating it by adding water to the resulting tincture; the spirit is then distilled off, and the residual cake of resin dried. It occurs in brownish translucent pieces, brittle, resinous in fracture, of a sweet fragrant odour if prepared from the root, but having a sour odour if obtained from the gum-resin; it is soluble in alcohol and ether. It cannot form singly an emulsion with water, and is thus distinguished from the gum-resin. Its tincture does not render the freshly-cut surface of a raw potato blue, showing the absence of guaiacum resin. Ether dissolves it entirely, showing that it is not adulterated with resin of jalap. Its chief constituent is a glucoside, *Scammonin*, which is identical with *Jalapin*, and allied in composition and properties to *Convolvulin*. The adulteration of scammony resin with common resin or colophony is detected by the immediate development of a deep-red colour on treating it with sulphuric acid.

The gum-resin (*Scammony*) is ash-gray and rough externally; fresh fracture is resinous, splintery, shining, black when dry; odour and flavour cheesy; causes, when chewed, a slight prickly sensation in the back of the throat; easily triturated into a dirty-gray powder, and converted with water into a smooth emulsion. It does not effervesce with hydrochloric acid, showing the absence of chalk. Boiling water agitated with the powder, cooled and filtered, does not strike a blue colour with tincture of iodine, showing the absence of starch. Ether removes from 80 to 90 per cent. of resin; and what remains is chiefly soluble gum, with a little moisture. Inferior scammony is in dark tenacious masses, not easily powdered, and contains but little resin.

Jalapa, Jalapæ Resina.

Jalap tubercles vary from the size of a nut to that of an orange, are ovoid, and the larger tubercles are frequently incised, the incisions being made to facilitate their drying; they are covered with a thin, brown, wrinkled cuticle, and present, when cut, a yellowish-gray colour, with dark-brown concentric circles. Inferior jalap is light, spongy in texture, and white internally. One hundred parts of jalap contain 17·65 of resin, the essential constituent, 20 of sugar, 19 of starch, 20·60 of cellulin, and 10·12 of gum. True jalap is known as "Vera Cruz Jalap." The root of Ipomæa orizabensis and of I. simularis, "Tampico Jalap," have been substituted for it.

The resin of jalap is in dark-brown opaque fragments, and by filtration through animal charcoal it can be obtained white, and in this form is known in commerce as "Jalapin." The brown fragments are fragrant, translucent at the edges, brittle, breaking with a resinous fracture, readily reduced to a pale-brown powder, sweetish in odour, acrid in the throat, easily soluble in rectified spirit, but only partially so in ether, and thus distinguished from the resin of orizaba and tampico roots; it is insoluble in oil of turpentine, and is thus distinguished from ordinary resin. Jalap resin consists of two portions—one, the active constituent, *Convolvulin* or *Rhodeoretin* ($C_{34}H_{56}O_{16}$), a white acid glucoside, which is insoluble in ether; the other, *Jalapin* ($C_{31}H_{50}O_{16}$), and *Jalapic acid*

($C_{62}H_{106}O_{35}$), a strongly acid resin, soluble in ether. Convolvulin readily dissolves in the fixed alkalies, and is by them converted into *Convolvulic acid;* nitric acid converts it into oxalic acid and *Ipomœic acid* ($C_{10}H_{18}O_4$), which is isomeric with *Sebacic acid.* Unlike scammony resin, jalap resin is not readily mixable with milk.

SOLANACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
CAPSICUM FASTIGIATUM Capsicum, Guinea- or Pod-Pepper, Chillies (*Zanzibar*)	Dried ripe fruit	Pulvis Capsici Tinctura Capsici	— 16½ grs. to 1 oz.	½ to 1 gr. 10 to 20 mins.	Stimulant and rubefacient. Given in dyspepsia and in alcoholism. As a gargle in sore throat.

Capsici Fructus.

Pod membranous, from five to eight inches long, two lines broad, straight, conical, pointed, smooth, shining, but somewhat corrugated, orange-red, intensely hot in taste. The red colour of powdered capsicum, "Cayenne pepper," gradually fades on exposure to light; it is liable to adulteration with red oxide of lead, coloured sawdust, etc. From an alcoholic extract of capsicum a bright orange-red oily liquid is obtained by ether, and this contains an acrid, volatile, crystalline alkaloid, *Capsicin;* this forms salts with acids; when heated with caustic potash it develops an odour resembling that of conine, and the mixture, on distillation, yields an alkaloid having this odour. Red colouring matter is also contained in the pods.

ATROPACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
ATROPA BELLADONNA Belladonna, Deadly Nightshade (*England and Germany*)	*a.* The fresh leaves with the branches	Ext. Belladonnæ	4 pts. from 100	¼ to 1 gr.	Dilates pupil, contracts arterioles, lessens pain, diminishes secretion, stimulates respiration and circulation. Antidote to opium, prussic acid, and Calabar bean. It relaxes spasm and is a local sedative.
		Succus Belladon.	—	5 to 15 mins.	
	b. The leaves dried	Tinct. Belladon.	1 oz. to 1 pt.	5 to 20 mins.	
	c. The dried root	Lin. Belladon.	1 oz. to 1½ ozs.	—	
		Ext. Bellad. Alcoholicum	—	$\frac{1}{16}$ to ¼ gr.	
		Emplast. Belladon.	1 pt. in 3	—	
		Unguent. Belladon.	50 grs. to 1 oz.	—	
		Atropina	—	—	
		Unguent. Atropinæ	8 grs. to 1 oz.	—	
		Atropinæ Sulph.	—	—	
		Liq. Atr. Sulph.	1 in 100	1 to 4 mins.	
		Lamellæ Atrop.	$\frac{1}{5000}$ gr. each	—	
DATURA STRAMONIUM Stramonium, or Thorn Apple (*Britain*)	Ripe seeds	Extr. Stramonii	—	¼ to ½ gr.	Resembles belladonna. Chiefly used in asthma, and as an anodyne in gastrodynia, etc.
		Tinctura Stramonii	54½ grs. to 1 oz.	10 to 30 mins.	
HYOSCYAMUS NIGER Hyoscyamus, Henbane (*Britain*)	*a.* Fresh leaves and young branches	Extr. Hyoscyami	—	5 to 10 grs.	Resembles belladonna, but is milder in its action. Sedative in nervous excitement. Anodyne, to allay irritation of bladder, to ease cough, diminish spasm, and prevent griping of purgatives.
		Pil. Col. c̄ Hyoscy.	1 in 3	5 to 15 grs.	
		Succus Hyoscyami	—	½ to 1 drm.	
	b. The dried leaves	Tinctura Hyoscyami	2½ ozs. to 1 pnt.	½ to 1 drm.	
NICOTIANA TABACUM Virginian Tobacco (*Tropical America*)	Dried leaves	—	—	—	Powerful cardiac sedative. Seldom given internally on account of the depression which it produces. Formerly given to produce muscular relaxation in hernia and ileus.

Belladonnæ Folia, Belladonnæ Radix.

The flowers of belladonna are pendant, bell-shaped, of a dingy-purple colour and greenish towards the base. The fruit is a round berry, deep purplish-black when ripe, resting on a broad calyx; it is two-celled, and contains many kidney-shaped seeds in a violet-coloured juice.

The leaves are dark-green, alternate, from three to six inches long, ovate, acute, entire, smooth; the uppermost are in pairs and are unequal; they are fœtid when bruised; the expressed juice, or an infusion, dropped into the eye dilates the pupil; they should be collected in June or July.

The root is from one to two feet long and from half an inch to two inches thick; it is branched and wrinkled and is brownish-white; an infusion of it dropped into the eye dilates the pupil. It should be collected in the early spring or in the autumn. The uncultivated plant is said to be preferable to the cultivated. The most important alkaloid is *Atropina* ($C_{17}H_{23}NO_3$), which is in combination with malic acid and exists but in small proportion. The leaves also contain, besides ordinary ingredients, *Asparagin* ($C_4H_8N_2O_3,H_2O$), a neutral substance which crystallises in very perfect octahedra and rhombic prisms; by acids or alkalies it is converted into ammonia and *Aspartic acid* ($HC_4H_6NO_4$). The root contains besides *Atropina* an amorphous alkaloid, *Belladonnin*, a red colouring matter, *Atrosin*, and a fluorescent substance.

Atropina occurs in colourless acicular crystals, sparingly soluble in water, more readily in alcohol, in ether, and in chloroform. Its solution in water has an alkaline reaction, gives a citron-yellow precipitate with terchloride of gold, has a bitter taste, and powerfully dilates the pupil. It is an active poison. Leaves no ash when burned with free access of air. By strong hydrochloric acid, or when left for a few hours in contact with caustic alkalies, lime-water or baryta-water, it is decomposed into *Tropic acid* ($C_9H_{10}O_3$) and *Tropine* ($C_8H_{15}NO$); these, minus a molecule of water = Atropine.

Atropinæ Sulphas is a colourless powder, soluble in water, and, unlike Atropine, insoluble in chloroform; its aqueous solution is neutral to test-paper. It leaves no ash when burned with free access of air.

Stramonii Semina.

The fruit is a large, ovoid, four-valved capsule filled with numerous seeds and thickly covered with sharp spines—hence its name "Thorn-apple." The seeds are brownish-black, reniform, flat, rough, of a bitter mawkish taste; inodorous, unless bruised, when they emit a peculiar heavy odour. All parts of the plant contain *Daturine* ($C_{17}H_{23}NO_3$), an alkaloid identical with *Atropine*, united with malic acid.

Hyoscyami Folia.

The flowers of henbane are in long one-sided cymes. The fruit—termed a pyxidium—is a spheroidal two-celled capsule containing numerous seeds, and is enclosed in a persistent urn-shaped capsule which opens transversely by a convex lid. The leaves are sinuated, clammy, hairy. The fresh herb has a strong unpleasant odour and a slightly acrid taste, which nearly disappears on drying. The fresh juice dropped into the eye dilates the pupil. Plants of the first year are nearly inactive; hence those of the second year alone should be selected; the leaves should be gathered when about two-thirds of the flowers are expanded.

All parts of the plant contain the alkaloid, *Hyoscyamine* ($C_{17}H_{23}NO_3$), which is united with malic acid, and is isomeric with atropine. It is an oily liquid which concretes after a time into warty crystals, has a tobacco-like odour, and is soluble in water, alcohol, ether, chloroform, and benzol. By caustic alkalies it is converted into the volatile alkaloid, *Hyoscina* ($C_6H_{13}N$), and *Hyoscinic acid* ($C_9H_{10}O_3$), a crystallisable substance having an odour like that of benzoic acid. The American resinoid substance, Hyoscyamin, should not be confounded with the pure alkaloid.

Tabaci Folia.

Large, mottle-brown, ovate or lanceolate, acuminate, having numerous short glandular hairs; acquire a peculiar heavy odour on drying; have a nauseous, bitter, acrid taste; yield when distilled with solution of potash an alkaline fluid which has the peculiar odour of *Nicotina*, and precipitates perchloride of platinum and tincture of galls. The leaves should not be manufactured, as they undergo in that process considerable chemical changes.

Virginian tobacco contains from 6 to 7 per cent. of *Nicotia* ($C_{10}H_{14}N_2$); this when pure occurs as a colourless volatile oil, but becomes yellow by exposure; its sp. gr. is 1·027; boils at 480°. It is soluble in water, alcohol, ether, and fixed oils; neutralises acids, forming with them very deliquescent salts; it probably exists in the plant united with malic acid. Tobacco also contains a concrete volatile oil, *Nicotianin* or tobacco camphor.

SCROPHULARIACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
DIGITALIS PURPUREA Digitalis, or Purple Foxglove (*Indigenous*)	Dried leaf	Pulv. Digitalis	—	½ to 1½ gr.	Cardiac stimulant; contracts arterioles; diuretic and antipyretic. Beneficial in cases of debility or irritability of the heart-muscle, and in cardiac dropsy. Given in delirium tremens and in adynamic fevers.
		Infus. Digitalis	28 grs. to 10 ozs.	2 to 4 drms.	
		Tinct. Digitalis	54½ grs. to 1 oz.	10 to 30 mins.	

Digitalis Folia.

The flowers are in long racemes, are purple, and the corolla somewhat resembles the finger of a glove—hence the name of the plant, "folk's-glove" or "fox-glove." The leaves are ovate-lanceolate, shortly petiolate, rugose, downy, pale on the under surface, crenate, almost odourless, but with a bitter acrid taste; they should be collected when about two-thirds of the flowers are expanded. The active constituent of the plant is a bitter, neutral, non-nitrogenised principle, *Digitalin*, which occurs in porous mammillated masses or small scales, white, inodorous, and intensely bitter; readily soluble in spirit, but almost insoluble in water and ether; it is precipitated by tannic acid; dissolves in acids, but does not form with them neutral compounds; its solution in hydrochloric acid is of a faint yellow colour, but rapidly becomes green. It powerfully irritates the nostrils, and is an active poison. Leaves no residue when burned with free access of air. It was formerly official.

Besides Digitalin, digitalis also contains *Digitalein*, an active, amorphous, bitter substance, together with a tasteless, inert, crystallisable substance. Digitalin of commerce is really a mixture of true Digitalin and Digitalein.

The leaves of Symphytum officinale, of Verbascum Thapsus, and of Inula Conyza have been substituted for those of digitalis, but the latter are easily recognised by the characters given above. The leaves of Verbascum nigrum closely resemble those of digitalis, but are smoother and have shorter stalks.

LABIATÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
Rosmarinus Officinalis Rosemary (*South Europe*)	Flowering tops	Oleum Rosmarini Spiritus Rosmarini	— 1 vol. in 50	1 to 5 mins. 10 to 50 mins.	Aromatic stimulant. Used in hysteria and nervous headache. Locally rubefacient and discutient. Oil enters into Lin. Saponis and into Tinct. Lavand. Co.
Lavandula Vera Common Lavender (*Britain*)	Flowers	Oleum Lavandulæ Spiritus Lavandulæ Tinct. Lavandulæ Co.	— 1 vol. in 50 45 mins. in 1 pnt.	1 to 5 mins. ½ to 1 drm. ½ to 2 drms.	Stimulant and carminative. Used in hysteria, hypochondriasis, and in flatulence, etc. Oil contained in Lin. Camph. Co.
Mentha Piperita Peppermint (*Britain*)	Fresh flowering plants	Ol. Menthæ Pip. Aqua Menthæ Pip. Essentia Menthæ Pip. Spiritus Menthæ Pip.	— 1½ drm. to 1 gall. 1 vol. in 5 1 vol. in 50	1 to 5 mins. 1 to 2 ozs. 10 to 20 mins. ½ to 1 drm.	Stimulant, carminative. Adjunct to purgatives. Relieves flatulence. Contained in Pil. Rhei Co. and Tinct. Chlorof. et Morph.
Mentha Arvensis Chinese Peppermint and other varieties	The distilled oil	Menthol	—	½ to 2 grs.	Is an antiseptic, but is employed as a local anæsthetic in facial neuralgia, sciatica, etc.
Mentha Viridis Spearmint (*Britain*)	Fresh herb	Oleum Menth. Virid. Aqua Menth. Virid.	— 1½ drm. to 1 gall.	1 to 5 mins. 1 to 2 ozs.	Aromatic stimulant and carminative. Used as an adjunct to purgatives, to correct flatulence and cover taste of nauseous drugs.
Thymus Vulgaris Monarda punctata, etc. Thyme	The distilled oil	Thymol	—	½ to 2 grs.	It is a powerful antiseptic, and is used as spray or dressing. It has been used for ringworms, psoriasis, and eczema.

Rosmarini Oleum.

Rosemary tops should be collected when coming into flower. They contain a volatile oil, bitter extractive, and tannin. The volatile oil ($C_{10}H_{16}$) is distilled in England; it is colourless, with an odour of the plant and a warm aromatic taste; sp. gr. 0·888; boils at 365°. On standing it deposits a stearoptene analogous to camphor. Its adulteration with oil of turpentine is detected by its sparing solubility in rectified spirit.

Lavandulæ Oleum.

The flowers should be collected in July and August; they yield a volatile oil which is obtained in this country by distillation; it is colourless or pale yellow, with the odour of the plant and a hot, bitter, aromatic taste; sp. gr. about 0·880; boils at 397°. It contains a hydrocarbon ($C_{10}H_{16}$), and by oxidation yields camphor. The oil is frequently obtained from Lavandula spica.

Menthæ Piperitæ Oleum.

Peppermint contains a volatile oil, a bitter principle, and some tannin. The oil, distilled in Britain, is colourless or pale yellow, with the odour of the plant and a warm aromatic taste which is succeeded by a sensation of cold in the mouth; sp. gr. 0·92; boils at 410°. It consists of a hydrocarbon, *Menthene* ($C_{10}H_{18}$), and *Menthol* or *peppermint-camphor* ($C_{10}H_{20}O$) is deposited on long standing or by cooling.

Menthol.

Is obtained by cooling the oil distilled from the fresh herb —it occurs in colourless acicular crystals, usually more or less moist from adhering oil, or in fused crystalline masses. Its melting-point should not exceed 110° F. It has the odour and flavour of peppermint, producing warmth on the tongue, or if air is inhaled a sensation of coolness. It is sparingly soluble in water and readily soluble in rectified spirit, the solutions having a neutral reaction. Boiled with sulphuric acid diluted with half its volume of water, menthol acquires an indigo-blue or ultramarine colour, the acid becoming brown. It should be entirely dissipated by the heat of a water-bath.

Menthæ Viridis Oleum.

The oil, distilled in Britain, is colourless or pale yellow, with the odour and taste of the plant; sp. gr. 0·914; boils at 320°. It consists of a hydrocarbon, identical with oil of turpentine, mixed with an oxidised oil, or stearoptene, isomeric with *Carvol* ($C_{10}H_{14}O$).

Thymol. ($C_{10}H_{13}HO$).

Is obtained by saponifying the oils with caustic soda and treating the separated soap with hydrochloric acid or by fractional distillation of the oil and exposure to a low temperature.

It forms large, oblique, prismatic crystals, having the odour of thyme and a pungent aromatic flavour. They sink in cold water, but at a temperature of 110° to 125° F. they melt and rise to the surface. Slightly soluble in cold water, freely in alcohol, ether and solutions of alkalies. The crystals volatilise completely at 212° F. A solution of thymol in half its bulk of glacial acetic acid, warmed with an equal volume of sulphuric acid, assumes a reddish-violet colour.

POLYGONACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
RHEUM PALMATUM AND OFFICINALE Rhubarb (*China, Tartary, and Thibet*)	Dried decorticated root	Pulv. Rhei.	—	5 to 20 grs.	In small doses stomachic and astringent; in large doses purgative. Beneficial in incipient diarrhœa and in atonic dyspepsia with constipation.
		Extractum Rhei	—	5 to 15 grs.	
		Infusum Rhei	1 in 40	1 to 2 ozs.	
		Pil. Rhei. Co.	1 pt. in 4	5 to 10 grs.	
		Pulv. Rhei. Co.	2 pts. in 9	20 to 60 grs.	
		Syrupus Rhei	—	1 to 4 drms.	
		Tinctura Rhei	44 grs. to 1 oz.	1 to 2 drms. (stomachic) 4 to 8 drms. (purgative)	
		Vinum Rhei	33 grs. to 1 oz.	1 to 2 drms.	

Rhei Radix.

The precise species whence the Asiatic drug is obtained was for some time unknown, but now is referred to Rheum officinale and R. palmatum. The root is not collected until the plant is six years old. It occurs in trapezoidal, roundish, cylindrical, or flattish pieces, frequently bored with a hole for suspension during drying, yellow externally, internally marbled with fine waving grayish or reddish lines, finely gritty under the teeth, owing to the presence of raphides (needle-shaped, or acicular, crystals) of insoluble oxalate of calcium; taste bitter, faintly astringent and aromatic; odour peculiar. Inferior rhubarb is decayed and worm-eaten. Boracic acid should not turn the yellow exterior brown, showing the absence of turmeric, which is used as an adulterant.

The following table, contrasting the principal commercial varieties of rhubarb, is from Smith's "Commentary:"—

ASIATIC.		EUROPEAN.
CHINESE.	RUSSIAN, The so-called "Turkey rhubarb"	
In cylindrical or rounded pieces, sometimes flattened at one or both sides.	In irregular and angular pieces.	In sticks or cylindrical pieces.
Exterior dull brownish-yellow; reticulated appearance.	Exterior brighter yellow.	Exterior reddish or brownish yellow. Striated or dotted, not reticulated.
Broken surface ragged, uneven, and irregularly variegated. Small stellate circles.	Broken surface similarly variegated. Stellate circles, especially near circumference.	Broken surface radiated in regular lines. No stellate spots.
Generally perforated with small holes.	Pierced with large holes, often reaching only to the centre.	Not pierced.
Gritty when chewed.	Gritty when chewed.	Not gritty under the teeth. Contains more tannin and starch.

English rhubarb is derived from Rheum Rhaponticum, and is cultivated near Banbury. The so-called "East-Indian rhubarb" is an inferior kind of the Chinese root; it is imperfectly scraped, is dense, breaks with a comparatively smooth fracture, and presents greenish or blackish stains.

Rhubarb root contains starch, and from 35 to 40 per cent. of crystals of oxalate of calcium ; its yellow colour is due to *Chrysophanic acid* ($C_{15}H_8O_3H_2O$ or $CH_3C_{14}H_5(OH)_2O_2$). This acid occurs in tasteless yellow crystals which are feebly soluble in water, but soluble in alcohol, ether, benzol, and alkalies, forming with the latter dark-red solutions; it exists in considerable quantities in "Goa powder." In addition, rhubarb contains some astringent matter in the form of tannic and gallic acids, a bitter substance and various resins; the purgative principle has not yet been isolated.

MYRISTACACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
MYRISTICA FRAGRANS. Nutmeg (*Banda Islands of the Malayan Archipelago*)	Kernel of the seed	Pulv. Myristicæ	—	—	Contained in numerous preparations.
		Oleum Myristicæ	—	1 to 5 mins.	Aromatic. stimulant, and carminative. Slightly astringent. Conttained in Spt. Amm. Arom. and Pil. Aloes Socot.
		Spirit. Myrist.	1 in 50	½ to 1 drm.	The same. A flavouring agent. Contained in Mist. Ferri Co.
		Ol. Myrist. Expressum	—	—	Topical stimulant. Ingredient of Empl. Calefaciens and of Empl. Picis.

Myristica, Myristicæ Oleum, Myristicæ Oleum Expressum.

The fruit of the nutmeg is about the size and form of a peach, smooth and yellow when ripe. It consists of an outer thick succulent pericarp, which when ripe becomes dry and splits into two or four valves, displaying the scarlet membranous network, or arillus, known as "mace," enclosing the seed. The kernel constitutes the "nutmeg," and is oval or nearly round, about an inch in length, marked externally with reticulated furrows, internally grayish-red with dark brownish veins. It has a strong peculiar odour and a bitter aromatic taste.

The volatile oil ($C_{10}H_{16}$), which is distilled in Britain, is colourless or straw-yellow, having the odour and taste of nutmeg; sp. gr. about ·930; boils at 329°. It contains an oxygenated oil, *Myristicol*, which is isomeric with *Carvol.*

The concrete or expressed oil, commonly known as "butter of nutmeg," is of an orange colour, firm consistence, and fragrant odour like that of nutmeg. It is soluble in about four parts of warm alcohol. It contains 6 per cent. of the volatile oil and several fatty acids, the most important of which is *Myristin* ($C_{45}H_{86}O_6$), in combination with glycerine. Myristicin is soluble in ether and benzol, but insoluble in cold alcohol. By saponification it is resolved into *Myristic acid* ($C_{14}H_{28}O_2$). It is also found in spermaceti and in oils of linseed and of poppy.

LAURACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
CINNAMOMUM ZEYLANICUM Cinnamon (*Ceylon*)	Inner bark of shoots	Aqua Cinnamomi	20 ozs. to 1 gall.	1 to 2 ozs.	Stimulant, aromatic, carminative; slightly astringent. Contained in several astringent preparations.
		Oleum Cinnamomi	—	1 to 5 mins.	
		Spiritus Cinnamomi	1 pt. in 50	1 to 2 drms.	
		Pulv. Cinnamom. Co.	1 pt. in 3	3 to 10 grs.	
		Tinct. Cinnamom.	2½ ozs. to 1 pt.	½ to 2 drms.	
CINNAMOMUM CAMPHORA Camphor (*China and Japan*)	Concrete volatile oil from wood	Aqua Camphoræ	½ gr. in 1 oz.	1 to 2 ozs.	Diffusible stimulant, antispasmodic, sedative, diaphoretic. Given in adynamic fevers, diarrhœa, antispasmodic diseases. Locally rubefacient and counter-irritant. Contained in many liniments and in Ung. Hydrarg. Co.
		Liniment. Camphoræ	1 in 5 nearly	—	
		Lin. Camph. Co.	54½ grs. to 1 oz.	—	
		Spirit. Camph.	1 in 10	10 to 30 mins.	
		Tinct. Camph. Co.	1½ gr. in 1 oz.	15 mins. to 1 drm.	

LAURACEÆ (*continued*).

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
SASSAFRAS OFFICINALE Sassafras (*North America*)	Dried root	—	—	—	Stimulant, diaphoretic. Used in making Decoct. Sarsæ Co.
NECTANDRA RODIÆI Bebeeru, or Greenheart Tree (*British Guiana*)	Bark	Beberinæ Sulphas	—	1 to 10 grs.	Tonic and antiperiodic. A substitute for quinine.

Cinnamomi Cortex, Cinnamomi Oleum.

The bark is about one-fifth of a line thick, in closely-rolled quills, which are about four lines in diameter, containing several small quills within them; are light yellowish-brown, with a fragrant odour, and a warm, sweet aromatic taste; breaks with a splintery fracture. Chinese cinnamon, the product of C. aromaticum, is inferior. It is known as "Cassia bark," and occurs in thicker and darker tubes, usually single-rolled. With tincture of iodine, a decoction of it gives a blue colour, which is not the case with true cinnamon.

The volatile oil is yellowish when recent, gradually becoming red, owing to oxygenation and formation of a resinous matter mixed with *Cinnamic acid* ($HC_9H_7O_2$); the oil has the odour and taste of the bark; sp. gr. is from 1·025 to 1·05; it, therefore, sinks in water like oil of cloves, etc. (p. 108). It boils at between 428° and 446°. It is composed of *Cinnamyl hydride* (C_9H_7OH), and a small proportion of a hydrocarbon isomeric with oil of turpentine. Cinnamyl hydride is the aldehyd of Cinnamic alcohol, and, when heated with nitric acid, yields essential oil of almonds and benzoic acid; treated with hydrate of potash, it is resolved into Cinnamic acid and hydrogen. Cinnamic acid is contained in many balsams, especially in storax and balsams of Tolu and Peru; treated with caustic baryta, it is converted into *Cinnamol* or *Styrol* (C_8H_8), with liberation of carbonic anhydride; this may be regarded as the radical hydrocarbon of the Cinnamic series, as *Benzol* is of the Benzoic series.

Camphora.

A concrete volatile oil or stearoptene obtained by sublimation. It is imported in the crude state in grayish-white grains (China or Formosa camphor), or in granular masses (Japan or Dutch camphor), and is purified in this country by mixing it with lime and resubliming it. So prepared, it is white, translucent, tough, and crystalline; has a powerful penetrating odour, and a pungent taste, followed by a sensation of cold. Sp. gr. 0·985 to 0·996, its density varying with temperature; it floats on water, and is thus distinguished from Borneo or Sumatra camphor, the product of Dryobalanops Camphora. It volatilises slowly at the ordinary temperature, and is deposited in hexagonal plates or prisms; sublimes entirely when heated, showing the absence of fixed impurities; it melts at 300°, boils at 400°, is very inflammable, and burns with a white flame; it is slightly soluble in water (1 in 1000), but is rendered much more soluble by the presence of carbonic acid, sugar, myrrh, carbonate of magnesium, etc.; it is readily soluble in rectified spirit, ether, chloroform, acetic acid, and fixed or volatile oils. It is difficult to pulverise except when a drop or two of rectified spirit, glycerine or ether is added to it; it may also be obtained in powder by precipitating its tincture with water. The formula of camphor is $C_{10}H_{16}O$. Distilled with phosphoric anhydride, it is resolved into *Cymol* ($C_{10}H_{14}$), a molecule of water being abstracted; heated with nitric acid, it is oxidised into *Camphoric acid* ($C_{10}H_{16}O_4$), which is odourless, and *Camphoretic acid* ($C_{10}H_{14}O_7$). Heated with caustic potash in alcohol, it is converted into Borneo camphor or *Camphol* ($C_{10}H_{18}O$), and *Camphic acid* ($HC_{10}H_{15}O_2$).

It is said to be adulterated sometimes with sal ammoniac, but the presence of the latter is readily detected by shaking the sample with a little water, and testing it with nitrate of silver.

Camphor exists in many plants, and appears to result from the oxidation of a volatile oil.

Sassafras Radix.

Occurs in branched pieces sometimes eight inches in diameter at the crown; the bark externally is grayish-brown, and internally rusty-brown; it is of an agreeable odour, and preserves a peculiar aromatic warm taste. The wood is light, porous, grayish-yellow, more feeble in odour and taste than the bark. It is also met with in chips. Sassafras yields a volatile oil which has the odour and taste of the root, and is the active ingredient; it is heavier than water, having a sp. gr. of 1·09. It consists of a hydrocarbon *Safren* ($C_{10}H_{16}$), sassafras camphor or *Sassafrol* ($C_{10}H_{10}O_2$), and an isomer *Safrol*; the root also contains tannic acid and red colouring matter.

Nectandræ Cortex.

In large, flat, heavy pieces, from one to two feet long, from two to six inches broad, about a quarter of an inch thick; grayish-brown externally, and dark cinnamon-brown internally. Its taste is strong, persistently bitter, and astringent. Besides tannic acid, resin, etc., the bark contains two alkaloids, *Nectandrine* $(C_{20}H_{23}NO_4)_n$ and *Beberine* ($C_{36}H_{22}N_2O_6$), a yellow resinous-looking substance, soluble in alcohol, and slightly so in ether. It is regarded by Watz as identical with *Buxine*, a constituent of common box; it forms salts with acids, one of which, the sulphate, is officinal.

Beberinæ Sulphas occurs in dark-brown thin translucent scales, yellow when in powder, with a strong bitter taste, soluble in water and in alcohol. Its watery solution gives a white precipitate with chloride of barium; and with caustic soda a yellowish-white precipitate of beberine, which is dissolved by agitating the mixture with twice its volume of ether. The ethereal solution, separated by a pipette and evaporated, leaves a yellow translucent residue, entirely soluble in dilute acids. Entirely destructible by heat. Water forms with it a clear brown solution.

ARISTOLOCHIÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
ARISTOLOCHIA SERPENTARIA Serpentary, or Virginian Snake-root (*United States*)	Dried rhizome	Inf. Serpentariæ Tinct. Serpentariæ	½ oz. to 1 pnt. 2½ ozs. to 1 pnt.	1 to 2 ozs. ½ to 2 drms.	Stimulant, tonic, diuretic, diaphoretic. Given in atonic dyspepsia, low febrile states, and in chronic rheumatism. Ingredient of Tinct. Cinchonæ Co.

Serpentariæ Radix.

A small roundish rhizome, with a tuft of numerous slender rootlets about three inches long, yellowish, of an agreeable camphoraceous odour, and a warm bitter camphoraceous taste. Contains a volatile oil, resin, an amorphous bitter extractive matter, together with tannin, sugar, and mucilage.

THYMELACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
DAPHNE MEZEREUM Mezereon (*England*)	Dried bark	Extract. Mezerei Æthereum	—	—	Local irritant and vesicant. In large doses emetic and purgative; in small doses diuretic and diaphoretic. Used in chronic rheumatism, etc. The bark is contained in Decoct. Sarsæ Co., and the Ethereal Extract in the Lin. Sinapis Co.

Mezerei Cortex.

In strips or quilled pieces of various lengths, tough and pliable, olive-brown on the surface, white within, fibrous, odour faintly nauseous, taste hot and acrid. Contains a volatile oil, an acrid resin, and a crystalline non-volatile glucoside, *Daphnin* ($C_{31}H_{34}O_{19}$); this, when boiled with dilute sulphuric acid, yields colourless prisms of *Daphnetin* ($C_{19}H_{14}O_9$). When the root is boiled in water an acrid vapour is given off.

EUPHORBIACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
Croton Eluteria Cascarilla (*Bahamas*)	Bark	Inf. Cascarillæ Tinct. Cascarillæ	2 ozs. to 1 pt. 2½ ozs. to 1 pt.	1 to 2 ozs. ½ to 2 drms.	Aromatic, stomachic and tonic. Given in atonic dyspepsia; in convalescence from acute diseases, etc.
Croton Tiglium Croton-oil plant (*East Indies*)	Oil expressed from the seeds	Oleum Crotonis Linim. Crotonis	— 1 vol. in 8	⅓ to 1 min. —	Powerful irritant, drastic purgative. Used in obstinate constipation; externally a counter-irritant.
Ricinus Communis Castor-oil plant (*East Indies and America*)	Oil expressed from the seeds	Oleum Ricini	—	1 to 8 drms.	Mild quick purgative. Ingredient of collodium Flexile, Lin. Sinapis Co., and Pil. Hyd. Subchlor. Co.
Mallotus Philippinensis Kamala, Wurrus (*India*)	Powder adhering to the capsules	Kamala	—	30 grs. to ¼ oz.	Anthelmintic in cases of tapeworm.

Cascarillæ Cortex.

In quills two or three inches in length, and from two to five lines in diameter, dull brown, but more or less coated with white crustaceous lichens; breaks with a short resinous fracture; is warm and bitter to the taste, and emits a fragrant odour when burned. It contains a bitter, neutral, crystalline principle, *Cascarillin* ($C_{12}H_{18}O_4$), which is sparingly soluble in water and chloroform, but freely in ether and hot alcohol; it also contains resin, gum, tannin, and a volatile oil which is isomeric with oil of turpentine.

Oleum Crotonis.

Croton-oil seeds are about half an inch in length, and a quarter of an inch broad; are oblong, a little flattened on the ventral surface, along which is the raised raphe. They are of a dull cinnamon-brown colour, and differ from castor-oil seeds in being smaller, rougher, and not polished or speckled. Most of the oil is prepared in England. It is slightly viscid, of a brownish-yellow colour, with an acrid taste and a faintly nauseous odour; it is soluble in ether, oil of turpentine, olive oil, and volatile oils; that prepared in England is much more soluble in rectified spirit than the oil which is imported from India. It is composed of the ordinary fatty acids, together with acetic, butyric, and valerianic acids; it also contains *Tiglic acid* ($C_5H_8O_2$), which is metameric with Angelic acid, and *Crotonic acid* ($C_4H_6O_2$), though Geuther says the latter does not exist. The irritant principle has not yet been isolated.

Oleum Ricini.

The leaves of the castor-oil plant, Palma Christi, are palmate, with seven to nine pointed serrate lobes; the flowers are monœcious; the capsule is covered with spines, is three-celled, each cell containing one seed. The seeds are somewhat larger than those of croton oil, are oval, compressed, obtuse at the ends, smooth, shining, and speckled with dark spots and veins; they are very irritant, and contain an acrid purgative principle, which has not been isolated.

The finest oil is that which is obtained by simple expression without the aid of heat, the so-called "cold-drawn" castor oil. Castor oil is viscid, colourless, or pale straw yellow, having a slightly nauseous odour, and a somewhat acrid taste. It differs from most other fixed oils in being entirely soluble in one volume of alcohol and in two volumes of rectified spirit. Its sp. gr. is 0·964. It does not congeal at zero. On exposure to the air it is apt to become rancid; on saponification it yields *Ricinoleic acid* ($HC_{18}H_{33}O_3$), and *Palmitic acid.* Peroxide of nitrogen converts it into a solid crystalline fat, *Ricinelaidic acid;* by nitrate of mercury and by orange nitric acid it is solidified; treated with ammonia it yields a crystalline amide, *Ricinolamide* ($C_{18}H_{35}NO_2$).

Kamala.

A fine, granular, mobile powder, of a brick-red colour; it is with difficulty mixed with water, but when boiled with alcohol the greater part of it is dissolved, forming a red solution. Ether dissolves most of it, the residue consisting principally of tufted hairs. It should be free from sand or earthy impurities. Under the microscope it is seen to consist of red rounded glands, composed of club-shaped cells mixed with minute stellate hairs. It consists of about 80 per cent. of resin, *Rottlerin* ($C_{11}H_{10}O_3$), with tannic acid, gum, volatile oil, etc.

SANTALACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
SANTALUM ALBUM Oil of Sandal-wood (*India*)	Wood	Oleum Santali	—	10 to 30 mins.	It acts as a stimulant to involuntary muscular tissue, and as a remote astringent on all mucous surfaces. It is used for gonorrhœa, gleet, leucorrhœa, etc.

Oleum Santali.

The oil is thick and of a pale yellow colour, with strongly aromatic odour and pungent spicy taste. Sp. gr. about

0·960. Neutral or slightly acid reaction, readily soluble in alcohol.

PIPERACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
PIPER NIGRUM Black Pepper (*East India*)	Dried unripe berries	Confectio Piperis	1 pt. in 10	60 to 120 grs.	Stimulant, stomachic. Rubefacient. Used in hæmorrhoids and gonorrhœa. Also in dyspepsia, flatulence, etc. Ingredient of Confectio Opii and Pulv. Opii Co.
CUBEBA PIPER Cubebs (*Java*)	Dried unripe fruit	Pulv. Cubebæ Oleum Cubebæ Oleo-resina Cubebæ Tinct. Cubebæ	— — 2½ ozs. to 1 pt.	30 to 120 grs. 5 to 20 mins. 5 to 30 mins. ½ to 2 drms.	Stimulant to mucous membranes, especially the urethral and vesical. Given in gonorrhœa, etc.
PIPER ANGUSTIFOLIUM Matico	Leaves	Inf. Maticæ	1 oz. to 1 pt.	1 to 4 ozs.	Leaf is locally a styptic. Stimulant and astringent internally to vesical and urethral mucous membranes.

Piper Nigrum.

A berry about the size of a small pea, roundish, wrinkled tegument, brownish-black, containing a grayish-yellow globular seed. Odour is aromatic, and the taste is pungent and bitterish. When decorticated it forms "white pepper."

Black pepper contains an acrid resin which is the essential ingredient, together with a volatile oil, isomeric with oil of turpentine, a fatty oil, some inorganic matter, and *Piperin* ($C_{17}H_{19}NO_3$). The latter is isomeric with morphine, and is a neutral, tasteless, odourless substance; it is soluble in alcohol and in acetic acid, is less soluble in ether, and is insoluble in water. Nitric acid decomposes it into *Piperic acid* ($HC_{12}H_9O_4$), and the alkaloid, *Piperedine* ($C_5H_{11}N$), which is oily, has the odour of pepper and ammonia, and forms crystalline salts with acids.

Cubeba, Oleum Cubebæ.

The fruit is rather larger than black pepper, is globular, wrinkled, blackish, supported on a stalk; has a warm camphoraceous taste and a characteristic odour. It contains a volatile oil ($C_{30}H_{48}$); an odourless, tasteless, inert, crystalline substance, *Cubebin;* an amorphous resin; *Cubebic acid;* some fixed oil, gum, and inorganic salts.

The volatile oil is distilled in Britain; it is colourless or pale greenish-yellow, having the taste and odour of cubebs. Boils between 430° and 480°. On exposure to cold it deposits crystals of *Hydrate of Cubebene* or *Camphor of Cubebs* ($C_{30}H_{48}2H_2O$).

Maticæ Folia.

From two to eight inches long, pointed, veined and tessellated in the upper surface, downy beneath, with an aromatic, slightly astringent, warm taste and an agreeable aromatic odour. Contains a volatile oil, a little resin, a crystallisable acid, *Artanthic acid*, and a trace of tannin.

SALICACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
SALIX ALBA The Willow Tree (Native)	The bark	Salicinum	—	3 to 20 grs.	Is a tonic and antiperiodic. Is used in the treatment of acute rheumatism, pyæmia, puerperal fever, etc., to reduce pyrexia.

Salicinum ($C_{13}H_{18}O_7$).

It occurs in colourless, shining crystals with a very bitter taste; it is soluble in water and alcohol, insoluble in ether. The crystals melt when heated, and emit vapours having the odour of meadow-sweet. Concentrated sulphuric acid turns salicin of a bright red colour. By boiling it with dilute sulphuric acid or acting upon it with *emulsin*, salicin is converted into *saligenin* ($C_7H_8O_2$) and glucose. Salicin and saligenin may both be converted, by oxidation with sulphuric acid and bichromate of potassium, into *salicylic aldehyde* ($C_7H_6O_2$), which is identical with the oil of meadow-sweet, and exhales the same peculiar odour.

LIQUIDAMBARACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
LIQUIDAMBAR ORIENTALIS Storax (*Asia Minor*)	Balsam from the bark	Styrax Præparatus	—	—	Stimulant to mucous membranes, and a stimulating application to ulcers. An ingredient of Tinct. Benzoini Co.

Styrax Præparatus.

The balsam is purified by means of rectified spirit and straining. It is a semi-transparent brownish-yellow semi-fluid resin, of the consistence of thick honey, with a strong agreeable odour and an aromatic bland taste. Heated in a test-tube in a vapour-bath it becomes more liquid, but gives off no moisture; boiled with solution of bichromate of potassium and sulphuric acid it evolves the odour of hydride of benzoyle (essence of bitter almonds). When pure it is soluble in alcohol and ether. Solid storax, styrax calmita, is not now official; it occurs in friable brownish-red masses which are covered on the surface with an efflorescence of cinnamic acid; it consists of liquid storax mixed with powdered liquidambar bark.

Storax contains a volatile oil, or *Styrol*, *Cinnamic acid*, *Styracin*, and resin. Styrol (C_8H_8) is an inflammable, volatile, transparent fluid; sp. gr. 0·924; boils at 295°; it has a burning taste, an aromatic odour, and is soluble in alcohol and ether. At 401° it is converted into the odourless and tasteless polymeric solid body, *Metastyrol*. *Cinnamic* acid ($HC_9H_7O_2$) is a powerful crystalline acid. *Styracin* ($C_{18}H_{16}O_2$) is a crystalline solid polymeric with hydride of cinnamyl ; it is soluble in ether, less soluble in alcohol, and insoluble in water ; by alkalies it is converted into cinnamic acid and *Styrone*, or cinnamic alcohol (HOC_9H_9O) ; oxidising agents liberate hydride of benzoyle from it.

CUPULIFERÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
Quercus Robur Common Oak (*Britain*)	Dried bark of small branches	Decoct. Quercûs	1¼ oz. to 1 pnt.	1 to 2 ozs.	Astringent. Chiefly used in the form of a lotion, gargle, or injection.
Quercus Lusitanica Gall, or Dyer's Oak (*Asia Minor*)	Galls	Tinctura Gallæ	54½ grs. to 1 oz.	½ to 2 dms.	Astringent. Test for Persalts of Iron. Source of Gallic and Tannic acids.
		Unguen. Gallæ	80 grs. to 1 oz.	—	
		Ung. Gallæ cum Opio	80 grs. to 1 oz.	--	

Quercus Cortex.

Should be collected in the spring. It is covered with a grayish shining epidermis, cinnamon-coloured on the inner surface, fibrous, brittle, and strongly astringent. It contains a peculiar variety of tannic acid called *Querci-tannic acid*. It differs from tannic acid in not yielding gallic acid when oxidised. Oak-bark also contains an uncrystallisable sugar, pectin, etc.

Galla.

Gall-nuts are excrescences caused by the punctures and deposited ova of the Cynips Gallæ tinctoria, a hymenopterous insect. They are hard, heavy, globular bodies, varying in size from half an inch to an inch in diameter, tuberculated on the surface—the tubercles and intervening spaces being smooth. There are two varieties—"blue" and "white;" the former are of a bluish-green colour on the surface, yellowish-white within, with a small central cavity, and intensely astringent. The "white galls" are grayish in colour, are less astringent, and are perforated with a small hole—the passage by which the insect works its escape. English galls are smooth on the surface. Another variety—"large Mecca galls," or "Dead sea apples"—are sometimes imported from Bussorah; they are spherical, and are surrounded about the centre by a circle of protuberances.

Galls contain about 35 per cent. of tannic acid, 5 per cent. of gallic acid, together with *Ellagic acid*, gummy and extractive matters, lignin, salts, etc. Tannic and Gallic acids are described under the head of ACIDS (pp. 18 and 23). Ellagic acid ($C_{14}H_6O_8$) forms a white crystalline powder which is insoluble in water, alcohol, or ether. Starch exists in gall-nuts, but only in the immediate vicinity of the central cavity.

MORACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
FICUS CARICA Fig (*Smyrna*)	The dried fruit	—	—	—	Demulcent, nutritive and laxative. An ingredient of Confectio Sennæ.
MORUS NIGRA Mulberry (*Britain*)	Juice of ripe fruit	Mori Succus	—	—	Refrigerant in fevers. Slightly laxative. A colouring agent.
		Syrupus Mori	1 (of Succus) in 3 (about)	1 drm.	

Ficus.

The so-called fruit is a "Syconus," and consists really of the matured result of an inflorescence, and not of a single flower; it is soft, tough, brown, covered with a saccharine efflorescence; contains numerous small hard seeds, the true fruits, in the interior, enclosed in a viscid pulp. These are quite closed in, except at the apex, where a small orifice exists. The fig consists chiefly of saccharine and mucilaginous matter.

Mori Succus.

The fruit is a "Sorosis," and consists of numerous small drupelets, each resulting from a separate flower attached to a common receptacle, and each containing a single seed, the fleshy covering of which is formed by the sepals. The juice is of a dark violet colour, with a faint odour and an acidulous sweet taste. It contains sugar, free acid—probably malic—albuminous matter, pectin, gum, salts, cellulin, and insoluble matters.

CANNABINACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
CANNABIS SATIVA Cannabis Indica, or Indian Hemp (*India*)	Dried flowering tops of female plants	Ext. Cannabis Indicæ	—	¼ to 1 gr.	Anodyne, antispasmodic, and soporific. Given in neuralgia, spasmodic cough, tetanus, hydrophobia, and other spasmodic diseases.
		Tinct. Cannabis Indicæ	22 grs. of extract. in 1 oz.	5 to 20 mins.	
HUMULUS LUPULUS Hop (*Britain*)	Dried catkins of female plants	Extract. Lupuli	—	5 to 15 grs.	Tonic, stomachic, slightly narcotic. In atonic dyspepsia, nocturnal emissions, chordee, etc.
		Inf. Lupuli	½ oz. to 10 ozs.	1 to 2 ozs.	
		Tinct. Lupuli	2½ ozs. to 1 pnt.	½ to 2 drms.	
		Lupulinum	—	2 to 5 grs.	

Cannabis Indica.

Tops, consisting of one or more alternate branches, bearing the remains of the flowers and smaller leaves and a few ripe fruits pressed together in masses, which are about two inches long, harsh, of a dark-green colour and a characteristic odour. In commerce three forms of Indian hemp are met with—viz., "Churrus," the concreted resinous exudation from the leaves, stems, and flowers; "Gunjah," the dried plant, which has flowered and from which the resin has been removed, packed in long bundles; "Bhang," or "Hashish" of the Arabs, the leaves and capsules without the stalks. The Pharmacopœia directs that, for medical use, the plant which has grown in India, and from which the resin has not been removed, is alone to be employed. The resin, *Cannabin*, is secreted in much larger proportion by the Indian than by the European plant. It is soluble in alcohol and ether, and is separated from its solution in these by the addition of water; it has a bitterish taste and a peculiar odour. A volatile oil is also contained in the plant; this is lighter than water, is amber-coloured, and has an oppressive odour; it has been resolved into a colourless liquid, *Cannabene* ($C_{18}H_{20}$), and a solid hydride of this ($C_{18}H_{22}$).

Lupulus.

The catkin or strobile is composed of thin, semi-transparent membranous scales of a greenish-yellow colour with minute yellow grains (Lupuline) adherent to their base; odour, aromatic; taste, bitter.

Lupuline occurs as a golden-yellow powder, having the peculiar flavour of the hops; under the microscope it appears to resemble pollen. Lupuline, in which the active principle of hops chiefly resides, contains a volatile oil, or resin, a nitrogenous substance, a gummy matter, tannic acid, and a bitter principle, *Lupulite* or *Humulin*. The latter is soluble in alcohol, slightly soluble in water, and insoluble in ether. The volatile oil is green, but may be rendered colourless by re-distillation; on exposure to air it is converted into a resinous mass. It contains a hydrocarbon ($C_{10}H_{16}$) with *Valerol* ($C_6H_{10}O$); the latter is converted into valerianic acid by the action of caustic potash. According to Griessmayer, hops contain a minute quantity of *Trimethylamine* and a liquid alkaloid having the odour of conine.

CONIFERÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
PINUS AUSTRALIS, P. TÆDA, P. PINASTER (*America and France*)	The oleoresin	Oleum Tereb.	—	10 mins. to 4 drms.	Oil of Turpentine is stimulant, antispasmodic, astringent, diuretic. Influences mucous membranes like Copaiba. In large doses purgative and anthelmintic. Given in hysteria, passive urinary and intestinal hæmorrhage. Externally, rubefacient, and as a fomentation in tympanitis.
		Conf. Tereb.	1 pt. in 4	1 to 2 drms.	
		Enema Tereb.	1 vol. in 16	—	
		Linim. Tereb.	16 pts. in 19	—	
		Lin. Tereb. Acet.	1 vol. in 3	—	
		Unguent. Tereb.	1 pt. in 2	—	
	Concrete turpentine from stem	Thus Americanum	—	—	Local stimulant.
		Empl. Picis			
PINUS SYLVESTRIS, ETC. Scotch Fir (*Northern Europe*)	A bituminous liquid from the wood	Pix Liquida	—	—	Internal and external stimulant. In skin diseases, bronchial affections, etc.
		Creasotum		1 min.	
		Mist. Creasoti	1 min. in 1 oz.	1 to 2 oz.	
		Ung. Creasoti	1 in 9	—	
		Vapor Creasoti	—	—	
		Ung. Picis Liquid	—	—	
	Oil distilled from leaves	Vapor	—	—	Same.
PINUS PICEA Spruce Fir (*Switzerland*)	A resinous exudation from the stem	Pix Burgundica	—	—	External stimulant and rubefacient. Contained in Emp. Ferri.
		Emplastrum Picis	—	—	
PINUS BALSAMEA Gilead Fir (*Canada*)	The turpentine obtained by incision	Terebinthina Canadensis	—	20 to 30 grs.	Like other turpentines; not much used internally. Ingredient of Charta Epispast., Collodium Flexile.
PINUS LARIX Larch (*Europe*)	Bark	Tinct. Laricis	2½ ozs. to 1 pnt.	20 to 30 mins.	Stimulant, astringent, and expectorant. Given in intestinal hæmorrhage, purpura. Also in cystitis, chronic bronchitis, etc.

CONIFERÆ (*continued*).

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
JUNIPERUS COMMUNIS Common Juniper (*Northern Europe*)	Oil distilled from unripe fruit	Oleum Juniperi Spirit Juniperi	— 1 vol. in 50	1 to 4 mins. ½ to 1 drm.	Stimulant diuretic.
JUNIPERUS SABINA Savin (*Britain*)	Fresh and dried tops and oil distilled from fresh plant	Pulv. Sabinæ Oleum Sabinæ Tinct. Sabinæ Ung. Sabinæ	— — 2½ ozs. to 1 pnt. 8 ozs. to 19 ozs.	4 to 10 grs. 1 to 5 mins. 20 mins. to 1 drm. —	Irritant, either externally or internally. Emmenagogue. Externally, to keep up discharge from blisters; internally, in deficient menstruation.

Oleum Terebinthinæ.

The oleo-resin, as it flows from the trunks of the several species of Pinus, is of a pale-yellow colour, with a characteristic pungent taste and odour; at first its consistence is that of treacle, but this varies with heat and exposure. It consists of resin dissolved in volatile oil, and these are separable by distillation. There are various varieties of turpentine, such as American, French, Chian, Venetian, etc.

Oil or Spirits of Turpentine or Camphine ($C_{10}H_{16}$) is the oil distilled from the oleo-resin. It is limpid and colourless, having the peculiar odour and taste of the oleo-resin. Sp. gr. 0·864; boils at 320°. It is inflammable; miscible with fixed or volatile oils; is soluble in alcohol and ether; shaken with water, a minute quantity of it dissolves, and the solution has no action on blue litmus-paper. It is a solvent of many bodies, as of caoutchouc, sulphur, phosphorus, fats, and resins, forming varnishes with the latter. On exposure it partly volatilises, and partly resinifies by oxidation. By the action of strong oxidising agents it is converted into formic acid. With hydrochloric acid it forms two artificial camphors, $C_{10}H_{16}HCl$ and $C_{10}H_{16}2HCl$. Nitric acid acts so violently on it as frequently to inflame it; it converts it into resin, and into oxalic, terebic, and other acids. The oil, when recent, detonates on mixing it with iodine. With water oil of turpentine forms three hydrates, *Terpinol*, $(C_{10}H_{16})_2H_2O$; *Terpine*, $C_{10}H_{16},2H_2O$; and *Terpine hydrate*, $C_{10}H_{16},3H_2O$. English and American oil of turpentine is dextrogyrate; German, French, or Venetian oil is lævogyrate.

Resina.

Resin or rosin is the residue of the distillation of the turpentines of various species of Pinus and Abies. It is translucent, yellowish, brittle, pulverisable; breaks with a shining fracture; has a faintly terebinthinate odour and taste; it is easily fusible, and is thus distinguished from gums; burns with a dense yellow flame and much smoke. It is insoluble in water, but soluble in alcohol, ether, fatty and bituminous substances. Sulphuric acid colours it red. Resin consists of three isomeric acids, *Pinic*, *Sylvic*, and *Pimaric* $(HC_{20}H_{29}O_2)$; the first of these is soluble in cold alcohol, sylvic acid is soluble in warm alcohol, while pimaric acid requires boiling alcohol for its solution. Turpentine yields from 75 to 90 per cent. of resin; American resin is much purer than English.

Thus Americanum.

Common Frankincense is the concrete turpentine spontaneously exuding from natural fissures in the bark of Pinus Tæda, the Frankincense Pine, and P. Australis, and other pines. It is a softish, bright yellow, opaque, solid substance; resinous, but tough, having the odour of American turpentine. On keeping it becomes hard. In its recent state it yields about 17 per cent. of volatile oil, and thus differs from resin. True Frankincense, the natural exudation of Abies excelsa, is not now imported into this country.

Pix Liquida.

Tar is a bituminous liquid obtained from the wood of Pinus sylvestris and other pines by destructive distillation;

it is thick, viscid, brownish-black, having a peculiar aromatic odour. Water agitated with it acquires a pale-brown colour, a sharp empyreumatic taste, and an acid reaction. The sp. gr. of tar is 1·040. Wood-tar is of a very complex constitution; on distillation, oil of turpentine, creasote, and other hydrocarbons pass over, and a black resin, "pitch," remains.

Oleum Pini Sylvestris.

A colourless oil, with an aromatic lavender-like odour, and a pungent, but not unpleasant, flavour. Sp. gr. ·870. Soluble in seven times its weight of spirit.

Creasote.

Is a product of the distillation of wood-tar. It consists of two homologous bodies, *Guiacol* ($C_7H_8O_2$) and *Creasol* ($C_8H_{10}O_2$). It is a liquid which is colourless or has a yellowish tinge and a strong empyreumatic odour. It is sparingly soluble in water (1 in 80), but freely soluble in alcohol, ether, and glacial acetic acid; sp. gr. 1·071. Boils at 400°. It coagulates albumen. A slip of deal dipped into it, and afterwards into hydrochloric acid, acquires on exposure for a short time to the air a greenish-blue colour. Dropped on white filtering-paper and exposed to a heat of 212° it leaves no translucent stain, showing the absence of fixed oils.

It is dextrogyrate; is not solidified by the cold produced by a mixture of hydrochloric acid and sulphate of soda. The presence of carbolic acid, which is the most frequent impurity, may be detected by its giving a violet-blue colour with perchloride of iron in an aqueous solution. True creasote is insoluble in ordinary glycerine which contains some water; carbolic acid, on the other hand, is soluble in it. With nitric acid creasote yields oxalic acid and a resinous mass. It does not yield aniline with ammonia, nor does it gelatinise collodion, as carbolic acid does. Its Pharmacopœial preparations are:—*Mistura Creasoti*, *Unguentum Creasoti*, and *Vapor Creasoti*.

Pix Burgundica.

Burgundy pitch is a resinous exudation from the stem of Pinus Picea, the Spruce Fir. It is melted in hot water, and strained through a cloth. It is hard and brittle, yet gradually taking the form of the vessel in which it is contained; opaque, varying in colour, but generally dull reddish-brown; of a peculiar, somewhat empyreumatic, perfumed odour, and aromatic taste, without bitterness; it is free from vesicles, gives off no water when heated; is almost entirely soluble in alcohol and glacial acetic acid. Its composition is the same as that of common resin obtained from turpentine, and it contains a little volatile oil.

Terebinthina Canadensis.

A pale-yellow ductile oleo-resin, of the consistence of thin honey, with a peculiar agreeable odour, and a slightly bitter acrid taste. By exposure it dries very slowly into a transparent adhesive varnish; solidifies when mixed with a sixth of its weight of magnesia, owing to the formation of a fine magnesian soap. It is composed of a volatile oil and resin, and is incorrectly named a balsam, as it contains neither benzoic nor cinnamic acid.

Laricis Cortex.

Occurs in flat pieces from three to six inches long, and from two to four inches wide; the inner surface is yellow and fibrous, and the outer surface, denuded of epidermis, is reddish; the epidermis is grayish, and is spotted with lichens, and beaded with resinous exudation; it has a faintly terebinthinate odour. It contains, besides turpentine, gum, sugar, and tannic acid, a volatile substance termed *Larixin* or Larixinic acid ($C_{10}H_{10}O_5$); this forms crystals like benzoic acid, is sparingly soluble in cold water or ether, but is more soluble in boiling water and alcohol; it is converted by nitric acid into oxalic acid; persalts of iron turn its solution purple.

Oleum Juniperi.

Juniper "berries," as the galbulus or fruit is improperly called, are about the size of black currants, of a dark purple colour, with a glaucous bloom. They are filled with a brownish-yellow pulp, and contain three angular seeds, have an agreeable terebinthinate odour, and, besides the volatile oil, contain resin, wax, gum, grape-sugar, lignin, and salts of lime. In the ripe fruit the volatile oil is converted into resin. Oil of juniper ($C_{10}H_{16}$) is most abundant in the unripe fruit; it is isomeric with oil of turpentine, colourless or pale greenish-yellow, with a sweetish odour and a warm aromatic taste. Sp. gr. 0·855. It is but slightly soluble in alcohol.

Sabinæ Cacumina, Sabinæ Oleum.

The twigs, which are collected in spring, are densely covered with minute imbricated oppressed leaves in four rows; they are of a dark-green colour, have a peculiar, strong, unpleasant odour, and an acrid, bitter, resinous, disagreeable taste. Besides the volatile oil, they contain resin, gallic acid, etc. The oil ($C_{10}H_{16}$) is isomeric with oil of turpentine; it is colourless or pale-yellow; sp. gr. 0·915; has the odour and taste of the plant; it is but slightly soluble in alcohol, but freely soluble in ether.

ZINGIBERACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
ZINGIBER OFFICINALE Ginger (*East and West Indies*)	Rhizome scraped and dried	Syrup. Zingiberis	—	1 drm.	Aromatic stimulant and sialagogue. Carminative. Given in atonic dyspepsia with flatulence. To correct griping of purgatives. Contained in several aperient and other preparations.
		Tinct. Zingiberis	2½ ozs. to 1 pnt.	15 mins. to 1 drm.	
		Tinct. Zingi. Fortior.	10 ozs. to 1 pnt.	5 to 20 mins.	

ZINGIBERACEÆ (*continued*).

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
CURCUMA LONGA Turmeric (*Ceylon*)	Rhizome	Turmeric Tinct. Turmeric Paper	1 to 6 —	— —	Test for alkalies. Not used as a remedy.
ELETTARIA CARDAMOMUM Cardamoms (*Malabar*)	The seeds contained n the dried capsules	Tinct. Cardamomi Co.	¼ oz. to 1 pnt.	½ to 2 drms.	Aromatic stimulant, stomachic, and carminative. Similar to ginger. Enters into many preparations.

Zingiber.

The rhizome occurs in irregular, lobed, decorticated pieces, three or four inches long, sub-compressed, yellowish-white but not chalky on the surface, with a short mealy fracture, hot taste, and agreeable aroma. The powder is yellowish-white. Two varieties are met with in commerce—viz., " white " or Jamaica ginger, which is prepared by scraping and scalding the rhizomes, and drying them by exposure to the sun. The other variety is the " black " or East Indian ginger, which is dried without being scraped.

Besides the ordinary constituents of roots, ginger contains a volatile oil, resinous matters, and abundance of starch. The volatile oil (C_5H_8) is the essential ingredient; its sp. gr. is 0·893; it possesses the aroma and taste of the rhizome.

Curcuma.

The best rhizomes are in short pieces, yellow externally, deep orange within, having a peculiar odour. Besides starch and an odorous, acrid, volatile oil, turmeric contains a yellow colouring principle, *Curcumin*, which is insoluble in water, but soluble in alcohol and ether. By the action of alkalies it is turned to a deep brown; but acids, except boracic, produce no change of tint.

Cardamomum.

The fruit is a three-celled capsule, ovate-oblong, triangular, light yellow, coriaceous, ribbed, and containing numerous seeds. The seeds are best kept within their pericarps, from which they should be separated when required for use, the pericarpial coats being rejected. They are obtusely angular, corrugated, reddish-brown, internally white, having a warm, aromatic, agreeable taste and odour. They yield about 4·5 per cent. of volatile oil, which has the taste and odour of the seeds; sp. gr. 0·93; it is a compound of a liquid portion and a crystalline camphor isomeric with turpentine camphor ($C_{10}H_{16}3H_2O$). The seeds also contain a fixed oil, an acrid resin, colouring matter, salts, etc.

IRIDACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
CROCUS SATIVUS Saffron (*Southern Europe*)	Dried stigma and part of style	Tinctura Croci	1 oz. to 1 pnt.	—	Colouring agent. Contained in Decoct. Aloes Co., Pil. Aloes et Myrrh., Pulv. Cretæ Ar., Tinct. Cinch. Co., Tinct. Opii Am. and Tinct. Rhei.

Crocus.

Consists of thread-like styles, each terminated by three long, orange-brown stigmas, broadest at the summit. It has a powerful odour. Rubbed on the wet finger it leaves an intense orange-yellow tint. When pressed between the folds of white filtering-paper it should leave no oily stain. The finest saffron is dried loosely and is known as "hay-saffron;" an inferior kind, "cake-saffron," is dried under pressure. Saffron contains an orange-red colouring matter, *Polychroit*, a glucoside, which, on decomposition, yields a volatile oil and *Crocin*. This latter, a red colour, is changed blue by sulphuric acid and green by nitric acid.

The *petals* of marigold and of safflower have been used to adulterate saffron; the *stamens* of the saffron have also been found mixed with its styles and stigmas. These adulterations may be detected by steeping in warm water, the form of the thereby expanded crocus stigma and style being characteristic. The weight of saffron is fraudulently increased by coating it with carbonate of lime previously tinged orange-yellow. If a few shreds of such saffron be placed on the surface of water in a wineglass and gently stirred, the water will immediately become turbid and the lime subside as a white powder. When dilute hydrochloric acid is dropped upon saffron thus adulterated, it will freely effervesce (*Pharmacographia*).

SMILACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
SMILAX OFFICINALIS Jamaica Sarsaparilla (*Jamaica*)	Dried root	Decoctum Sarsæ	2½ ozs. to 1 pnt.	2 to 10 ozs.	Diaphoretic, tonic, alterative. Given in syphilis, scrofula, chronic rheumatism, gout, skin diseases, etc.
		Decoct. Sarsæ Co.	2½ ozs. to 1 pnt.	2 to 10 ozs.	
		Ext. Sarsæ Liquid.	1 pd. to 16 ozs.	2 to 4 drms.	

Sarsæ Radix.

Roots not thicker than a goose-quill, generally many feet in length, reddish-brown, covered with rootlets, which are often subdivided and are then said to be "bearded." They are folded in bundles about eighteen inches long, scentless, with a mucilaginous, feebly bitter, faintly acrid taste. The roots consist of a cortex and a ligneous portion or meditullium enclosing the pith. According to the characters of these layers the Sarsaparillas of commerce have been classified into "Mealy" and "Non-mealy." The following description is from "Garrod's Materia Medica":—

"In the *non-mealy* varieties the cortex is deeply coloured and not mealy. Although some starch-granules can be detected under the microscope, still the number is comparatively few. The diameter of the meditullium is generally four or five times greater than that of the cortex. Oil of vitriol applied to a transverse section causes both cortex and wood to become of a dark red tint, and iodine shows but a small amount of starch. Under this division are included the *Jamaica*, the *Lima*, and the *true* or *lean Vera Cruz*.

"The *Jamaica*, the only officinal Sarsaparilla, occurs in bundles from a foot to a foot and a half in length, with spirally twisted roots, not thicker than a goose-quill, several feet in length, folded, with numerous rootlets (*bearded*) of a reddish-brown colour. Jamaica Sarsaparilla has a mucilaginous and slightly bitter and acrid taste; it is not mealy, but yields much extractive matter when heated with water.

"*Lima* Sarsaparilla occurs in bundles, about two or three feet long, folded with the chump (or root-stack) in the interior, of a grayish-brown colour. It is derived from Smilax officinalis.

"The *true Vera Cruz* Sarsaparilla is not often found in commerce; it is lean, unfolded, with few rootlets; the chump is present.

"The *mealy* varieties are distinguished by the large amount of starch contained in the inner cortical layers, which are sometimes equal in thickness to the meditullium; they break with a starchy fracture: the cortex is often cracked transversely, and sometimes falls off; they have occasionally a swollen appearance, and are then named gouty. If a drop of sulphuric acid be added to a transverse section, the mealy coat is unchanged, the ligneous zone becomes dark purple, and when a solution of iodine is applied, the starchy layer becomes evident, from the formation of the blue iodide of starch.

"The mealy varieties include the *Honduras*, the *Brazilian*, and the *Caraccas* or gouty Vera Cruz.

"The *Honduras* Sarsaparilla occurs in bundles, about three feet long, composed of the folded roots, secured by a few circular twists; of a dirty brown colour, with many lateral fibres, but no chump; it is very mealy. It is brought from the Bay of Honduras. The botanical origin is doubtful.

"The *Brazilian* or *Lisbon* Sarsaparilla occurs in bundles, from three to five feet long, composed of the unfolded roots, bound together very tightly by a flexible stem; of a reddish brown colour, with few rootlets. It comes from the Brazils, through Lisbon. It is probably derived from Smilax papyracea and Smilax officinalis.

"*Caraccas* or *Gouty Vera Cruz* Sarsaparilla is found in bundles, two feet and a half long, and one foot broad, of a pale yellow colour. The chump is present, and it is very mealy. Derived from Smilax officinalis and syphilitica."

Sarsaparilla spoils by keeping. Its most important constituent is *Sarsaparillin*, *Smilacin* or *Parillinic acid*, a crystallisable neutral bitter principle which is soluble in hot water, alcohol, and ether, but is almost insoluble in cold water; it turns sulphuric acid red. Sarsaparilla also contains a volatile oil, which is heavier than water, with starch, ligneous fibre, etc.

LILIACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
URGINEA SCILLA Squill (*Mediterranean Coasts*)	Sliced and dried bulb	Pulv. Scillæ	—	1 to 3 grs.	Stimulating expectorant and diuretic. In large doses cathartic and emetic. Given in bronchitis and dropsy.
		Acetum ,,	2½ ozs. to 1 pnt.	15 to 40 mins.	
		Oxymel ,,	—	½ to 1 drm.	
		Pil. Scillæ Co.	1 pt. in 5	5 to 10 grs.	
		Pil. Ipecac. cum Scilla	1 pt. in 7	5 to 10 grs.	
		Syrup. Scillæ	—	½ to 1 drm.	
		Tinct. ,,	2½ ozs. to 1 pnt.	10 to 30 mins.	

LILIACEÆ (*continued*).

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
ALOE VULGARIS ALOE PERRYI *a.* Barbadoes and *b.* Socotrine Aloes (*East and West Indies, Socotra*)	Inspissated juice of cut leaf	*a.* Pulvis Aloes Barbadensis	—	2 to 6 grs.	Purgative. Emmenagogue. Used in dyspepsia, habitual constipation, amenorrhœa. Ingredient of Pil. Cambog. Co., Pil. Coloc. Co., and Pil. Coloc. et Hyos.
		Enema Aloes	4 grs. in 1 oz.	—	
		Extr. Aloes Barb.	8 pts. from 10	2 to 6 grs.	
		Pil. Aloes Barb.	1 pt. in 2	5 to 10 grs.	
		Pil. Aloes et Ferri.	1 pt. in 5½	5 to 10 grs.	
		b. Pulvis Aloes Socotrinæ	—	2 to 6 grs.	Same action. An ingredient of Pil. Rhei Co. and Tinct. Benzoin. Co.; and (the extract) of Ext. Colocynth. Co.
		Decoct. Aloes Co.	1 pt. (*ext.*) in 100	½ to 2 ozs.	
		Enema Aloes	4 grs. in 1 oz.	—	
		Extr. Aloes Soc.	1 pt. from 2	2 to 6 grs.	
		Pil. Aloes Soc.	1 pt. in 2	5 to 10 grs.	
		Pil. A. et Assaf.	1 pt. in 4	5 to 10 grs.	
		Pil. A. et Myrrh.	1 pt. in 3	5 to 10 grs.	
		Tinct. Aloes	11 grs. in 1 oz.	1 to 2 drms.	
		Vinum Aloes	16½ grs. in 1 oz.	1 to 2 drms.	
		Aloin	—	½ to 2 grs.	Same.

Scilla.

The squill bulb is pear-shaped, varies greatly in size, and weighs from ½ lb. to 10 lb. It consists of overlapping scales—the outer ones being membranous, thin, and brownish-red, or white; the inner scales are thick, white, fleshy, and juicy. The taste is mucilaginous, intensely and disagreeably bitter, and somewhat acrid. The dried scales are white, or yellowish-white, slightly translucent and horny, like Tragacanth; they are scentless, disagreeably bitter in taste—easily pulverisable if very dry, but if exposed readily recovering moisture and flexibility. In preparing the scales the inert central ones and the dry outermost ones are rejected. Squill consists of water with gum, uncrystallisable sugar, a trace of tannin, phosphate of lime, and a bitter, resinous extractive, from which a principle named *Scillitin* has been obtained, together with a peculiar resinous acrid principle. The aqueous infusion of squill is rendered deep-purple by persalts of iron.

Aloe Barbadensis, Aloe Socotrina.

The plant yielding Barbadoes aloes is the Aloe vulgaris; Socotrine aloes is the produce of the Aloe Perryi and other undetermined species. In the following table the characters of the two officinal varieties of Aloes are contrasted :—

Barbadoes Aloes.	*Socotrine Aloes.*
In yellowish-brown or dark-brown opaque masses.	In reddish-brown masses, opaque or translucent at the edges.
Breaks with a dull conchoidal fracture.	Breaks with an irregular and resinous fracture.
Has a bitter nauseous taste.	Has a bitter taste.
Has a strong disagreeable odour.	Has a strong fragrant odour.
Powder is of a dull olive-green colour.	Powder is of a bright orange-yellow colour.
Is more soluble in water.	Is less soluble in water.
Is usually imported in gourds.	Is usually imported in skins or chests.

Both varieties dissolve almost entirely in proof spirit, and during solution exhibit, under the microscope, numerous minute crystals.

Hepatic or *East Indian Aloes* is non-officinal; it is of a dark reddish-brown or liver colour, opaque or translucent, brittle, having a bitter taste, but not an unpleasant odour; the powder is yellow, and is crystalline.

Cape Aloes, the produce of Aloe spicata, etc., is met with in masses of a greenish-brown colour, having some translucently; it breaks with a conchoidal fracture; its odour is strong but not nauseous; its powder is greenish-yellow, but is non-crystalline. *Caballine Aloes* is an inferior variety of Cape Aloes.

All Aloes yield an active purgative principle, *Aloin* ($C_{16}H_{18}O_7$); but each of the commercial varieties contains a peculiar aloin of its own.

Aloin.

Occurs in a crystalline and an amorphous form—the former is a bright yellow powder, neutral, very bitter, forming yellow solutions which become red on exposure—a change which is immediately effected by nitric acid. Sulphuric acid forms with it a dirty-green solution. The amorphous aloin probably bears the same relation to the crystalline variety that uncrystallised syrup does to cane-sugar; it is very soluble in water. Aloes is also said to yield a resin, so called, which, however, is soluble in boiling water, and is probably merely modified aloin. A volatile oil exists in very small quantity in aloes. By the action of nitric acid on aloes several crystalline compounds are formed—as *Polychromic*, *Chrysammic*, and *Chrysolepic acids.* An acid named *Aloetic* is found in aloes; it strikes olive-brown with ferric salts.

MELANTHACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
VERATRUM VIRIDE American Swamp or Green Hellebore, or Indian Poke (*North America*)	Rhizome	Tinct. Veratri Viridis	4 ozs. to 1 pnt.	5 to 20 mins.	Topical irritant, emetic, drastic purgative, vascular sedative. Externally in skin diseases; internally in inflammatory diseases.
SCHÆNOCAULON OFFICINALE Sabadilla, or Cevadilla (*Mexico*)	Dried fruit	Veratrina Unguent. Veratrinæ	— 7 grs. to 1 oz.	— —	Local irritant, emetic, vascular sedative. Ointment used in neuralgia and rheumatism. Given internally in acute febrile affections, acute rheumatism, gout, etc.

MELANTHACEÆ (*continued*).

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
COLCHICUM AUTUMNALE Meadow Saffron (*Europe*)	*a.* Fresh and dried corm	Pulv. Colch. Ext. ,, Ext. Colch. Aceticum Vinum Colch.	— — — 88 grs. to 1 oz.	2 to 8 grs. ½ to 2 grs. ½ to 2 grs. 10 to 30 mins.	Cholagogue, diuretic, vascular sedative. In large doses purgative and emetic. Given principally in gout and gouty affections, and in rheumatism.
	b. Seeds	Tinctura Colch.	54½ grs. to 1 oz.	10 to 30 mins.	

Veratri Viridis Radix.

The rhizome is collected in autumn and is dried; it is thick and fleshy, and gives off numerous pale yellow radicles which are marked with indentations; it has a peculiar acrid taste, and produces a sensation of tingling about the fauces. It contains two alkaloids, *Veratria* and *Viridia*, or *Jervine*—the former of these is not identical with the Veratria of cevadilla. Green hellebore root also contains a resin, gallic acid, etc.

Sabadilla.

The dried fruit is about half an inch long, consisting of three light-brown papyraceous follicles, each containing from one to three seeds which are about a quarter of an inch long, blackish-brown, shining, winged, and possessing an intensely bitter taste. Cevadilla owes its virtues to the presence of the alkaloid *Veratrina* ($C_{32}H_{50}NO_9$), which is probably combined with gallic acids; it also contains a little resin and fatty matter, and two acids—*Veratric* and *Cevadic*—have been obtained from it. The following are the characters and tests of the officinal *Veratrina*:—Pale gray, amorphous, without smell, but, even in the most minute quantity, powerfully irritating the nostrils; strongly and persistently bitter, and highly acrid; insoluble in water, sparingly soluble in spirit and ether, but readily in diluted acids, leaving traces of an insoluble brown resinoid matter. An active poison. Heated with access of air it melts into a yellow liquid, and at length burns away, leaving no residue. In contact with sulphuric acid it assumes an intense red colour, and with nitric acid it forms a yellow solution.

The Veratria of commerce contains another principle, *Sabadillina,* which differs from Veratria in being insoluble in ether and in not exciting sneezing.

Colchici Cormus, Colchici Semina.

Colchicum autumnale is indigenous. "In the course of the autumn its elegant lilac-purple flowers emerge from the ground, unaccompanied by leaves (hence its vulgar name of 'naked ladies'); a large portion of the long narrow tube of the corolla being concealed in the ground, and bearing the ovary at its base. In the following spring the leaves come up together with the fruit, which rises on a stalk above the surface in the form of three-lobed and three-celled capsules, which ripen their seeds about midsummer. As the summer passes a bud of new corm begins to form at the base of the old one, and is received into a furrow in its side. Sometimes there is a bud with a corresponding notch on each side. The young corm attains perfection about the middle of next summer, which, accordingly, is the proper time for its collection. The seeds ripen in summer, and should be gathered about August."—Smith.

The fresh corm is about the size of a chestnut, flattened where it has an undeveloped bud; furnished with an outer brown and an inner yellow coat; internally white, solid, and fleshy; yielding when cut a milky, acrid, and bitter juice. The dried corms are prepared by stripping off the outer coat, slicing them transversely, and drying at a temperature not exceeding 150°. The dried slices are about a line thick, moderately indented on one, rarely on both sides; are firm, flat, whitish, amylaceous, and have a bitter acrid taste.

The ripe seeds are about the size of white mustard, are very hard, and of a reddish-brown colour. They are not injured by drying, hence the tincture of them is a more certain preparation than the wine of the corm. Both corm and seeds contain fatty matters, gum, starch, lignin, *Cevadic acid*, and a crystalline principle, *Colchicine* ($C_{17}H_{23}NO_6$). This was formerly considered to be identical with veratria, but it has a less burning taste, is much more soluble in water, and does not excite sneezing; nitric acid turns it a deep violet. It has seldom been isolated.

GRAMINACEÆ.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
TRITICUM VULGARE Wheat (*Europe*)	The grain, ground and sifted	Farina Tritici	—	—	Nutritive, demulcent. Ingredient of Cataplasma Fermenti.
		Mica Panis	—	—	
		Amylum	—	—	
		Glycerin. Amyli	1 pt. in 11	—	
		Mucilago Amyli	12 grs. in 1 oz.	—	
HORDEUM DISTICHON Pearl Barley (*Britain*)	Husked seeds	Decoct. Hordei	—	—	Nutritive, demulcent.
SECALE CEREALE Common Rye (*Britain*)	Spawn of fungus, Claviceps purpurea, within the paleæ	Ergota	—	20 to 30 grs.	Contracts the arterioles, and the uterus. Valuable in hæmorrhages, in tedious labour, purpura, etc.
		Ext. Ergot. Liq.	1 oz. to 1 oz.	10 to 60 mins.	
		Infus. Ergotæ	11 grs. to 1 oz.	1 to 2 ozs.	
		Tinct. Ergotæ	1 pt. in 4	5 to 30 mins.	
		Ergotinum	—	—	
		Injectio Ergotini Hypodermica	— 10 pts. in 27	— 3 to 10 mins.	Same, used hypodermically.
SACCHARUM OFFICINARUM Cane Sugar (*East and West Indies*)	The juice of the stem	Saccharum Purificatum	—	—	Demulcent. Dietetic. Enters into several preparations.
		Theriaca	—	—	Treacle is slightly laxative. Sweetening agent.

Farina Tritici.

The grain of wheat ground and sifted. Flour consists of starch, about 70 per cent., and gluten, about 10 per cent., together with gum, sugar, mucilage, and water, with phosphates of soda, lime, and magnesia in small quantity. If it be kneaded under a stream of cold water the starch is washed away, and gluten remains as a grayish-white, adhesive, ductile mass. Thus prepared the gluten consists of vegetable fibrine and vegetable albumen, the former being soluble in alcohol, the latter insoluble.

Amylum.

Starch ($C_6H_{10}O_5$) is found in most plants, but very abundantly in the seeds of all grasses, in fleshy seeds such as beans and chestnuts, and in tuberous roots and stems. It occurs in white columnar masses, and under the microscope is seen to consist of small ovoid or angular transparent granules with concentric rings surrounding the central hilum. Its sp. gr. is 1·5. When rubbed in a Wedgwood mortar with a little cold distilled water, it is neither acid nor alkaline to test-paper, and the filtered solution does not become blue on the addition of solution of iodine, showing the absence of potato starch. If starch be kept in a moist state acetic acid is apt to be developed. Mixed with boiling water and cooled, starch gives a deep blue colour with iodine; in this test the decoction must first be cooled, as the blue colour of iodide of starch is discharged by a heat of 200°. When starch is heated with dilute sulphuric acid a soluble isomeric compound, *Dextrin*, is first formed, and this is ultimately converted into *Glucose*. Under the influence of ptyalin or diastase starch is converted into sugar. Strong nitric acid converts it into oxalic acid.

Hordeum Decorticatum.

Pearl Barley is white, rounded, retains a trace of the longitudinal furrow. Contains gluten, starch, gum, saccharine matters, fat, lignin, and salts.

Ergota.

Ergot is the diseased grain of common rye, the cause of the disease being the deposition of the sclerotium (compact mycelium or spawn) of the fungus Claviceps purpurea within the paleæ. The ergot grains are sub-triangular, curved, with a longitudinal furrow on the concave side, obtuse at the ends, from one-third of an inch to an inch and a half in length. They somewhat resemble the spur of a cock—hence the name "spurred rye." They are of violet-brown colour on the surface, pinkish within, solid, frangible, breaking with a short fracture. The odour is faintly marked, but strong if the powder be triturated with solution of potash, owing to the liberation of a volatile alkaloid, Trimethylia or Secalia (C_3H_9N). Ergot contains a large quantity of fixed oil—about 35 per cent.; this, if expressed, is inactive, but as usually prepared contains an active principle or principles. A peculiar reddish-brown substance having active principles has been named *Ergotin*. Recent researches tend to prove that ergot contains at least three active principles, namely *Ergotinic acid*, *Sphacelinic acid*, and an alkaloid *Cornutine*. By distillation of ergot with potash, trimethylamin, $(CH_3)_3N$, has been procured, a substance having the peculiar odour of herring pickle.

Ergot yields its virtues to alcohol and water.

Ergotinum.

The official preparation is reddish-brown in colour, miscible with water, forming a red solution, and it has a strong bitter taste.

Saccharum Purificatum.

There are few plants which do not contain sugar. White sugar occurs in compact crystalline conical loaves, snow-white, dry, scentless, and intensely sweet. Sucrose or cane-sugar ($C_{12}H_{22}O_{11}$) is soluble in half its weight of cold water, and is much more soluble in hot water, forming a viscid syrup. The aqueous solution produces a right-handed rotation on a ray of polarised light. Sugar becomes phosphorescent on rubbing pieces of it together. Crystallised from a strong solution, it forms oblique four-sided prisms, constituting "sugar-candy." Heated to 365° it melts, and when cooled suddenly, solidifies into an amorphous transparent substance, known as "barley-sugar." By prolonged boiling it forms uncrystallisable sugar (fruit-sugar, inverted sugar, or Lævulose); and if the boiling be still further continued, it is converted into Glucose or grape-sugar ($C_6H_{12}O_6,H_2O$); by weak acids and by fermentation a similar change is readily effected. Cane-sugar differs from grape-sugar in several particulars, as shown in the following table:—

Sucrose.	*Glucose.*
Charred by cold sulphuric acid.	Not charred by cold sulphuric acid.
Does not reduce an alkaline solution of potassio-tartrate of copper on boiling.	Reduces an alkaline solution of potassio-tartrate of copper on boiling.
Not altered when boiled with solution of potash.	Turned brown when boiled with solution of potash.
Crystallises in four or six-sided rhomboidal prisms.	Crystallises in cubes or square tables.
Less soluble in water.	More soluble in water.

Sugars are all carbo-hydrates, the hydrogen and oxygen being in the proportion to form water; and the number of atoms of carbon is six, or a multiple of that number. Gums, starches, and celluloses are also carbo-hydrates.

Theriaca.

Treacle, Sacchari Fæx, is the uncrystallisable residue of the refining of sugar; it is a thick brown syrup, very sweet; sp. gr. about 1·40. It is fermentable with yeast, yielding rum on distillation. It should be free from any empyreumatic odour and flavour.

FILICES.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
Aspidum Filix Mas Male Shield Fern (*Britain*)	Dried rhizome, with part of foot stalks and root fibres	Extract. Filicis Liquid.	—	15 to 30 mins.	Tæniacide.

Filix Mas.

The caudex or central part is thick and cylindrical; it is tufted, scaly, greenish-brown; powder is greenish-brown, with a disagreeable odour, and a nauseous, bitter, somewhat astringent taste.

Male-fern contains, besides tannin, starch, gum, and salts, a volatile oil, a green fixed oil, and resin. The active principle is soluble in ether, the ethereal extract deposits a colourless crystalline substance, *Filicic acid* $(C_{14}H_{18}O_5)$; the green liquid portion of the extract consists chiefly of *Glyceride of Filixolyn*, which yields, on saponification, *Filosmylic* and *Filoxylic acids.*

LICHENES.

Name and Habitat.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
Cetraria Islandica Iceland Moss, or Liverwort (*Iceland*)	Entire lichen	Decoct. Cetrariæ	1 oz. to 1 pnt.	1 to 2 ozs.	Demulcent and slightly tonic.
Roccella Tinctoria, etc. Litmus (*The Azores, etc.*)	Blue colouring matter	Litmus Tincture	—	—	Test for acids and alkalies.
		Litmus Paper, Blue	—	—	
		Litmus Paper, Red	—	—	

Cetraria.

Iceland moss occurs as a foliaceous, lobed, crisp, cartilaginous thallus; brownish-white, paler beneath; taste bitter and mucilaginous. A strong decoction gelatinises on cooling, and the gelatinous matter (*Lichenin* or lichen-starch, $C_{12}H_{20}O_{10}$), when dried, forms a semi-transparent mass, which is insoluble in cold water, alcohol, or ether, but is soluble in boiling water, and the solution strikes blue with iodine. Unlike gum or the jelly of Chondrus Crispus—Irish or Carrageen moss—it yields merely a trace of mucic acid on boiling with strong nitric acid; by boiling with dilute acids it is converted into sugar. Iceland moss also contains *Licheno-stearic acid* ($C_{14}H_{34}O_3$), *Famaric acid*, a little sugar, and a crystallisable bitter principle, *Cetraric acid* ($C_{18}H_{16}O_8$); this latter is soluble in alcohol, ether, and in alkaline solutions, but sparingly in water.

Litmus.

Litmus is prepared by macerating the lichen in water with ammonia and exposing the mixture to the air for several days. At first it becomes red, and then blue; it is then removed, reduced to a proper consistence, and made up into small cakes with chalk or plaster-of-Paris. It has the odour of violets; yields to water and to alcohol its blue colouring-matter. When heated strongly it does not evolve a violet vapour, or afford a sublimate of copper-coloured crystals, showing the absence of indigo. The chief constituent of the blue colouring-matter of litmus is *Orcein* ($C_7H_7NO_3$). This is formed by the action of ammonia and the oxygen of the air on *Orcin* ($C_7H_8O_2$), which itself is the product of the decomposition of certain acids existing in the lichen (*Orsellinic acid*, *Erythric acid*, etc.), and is extracted from them by the influence of alkalies.

ANIMAL KINGDOM.—CLASS MAMMALIA.

RUMINANTIA.

Name and Distribution.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
Moschus Moschiferus The Musk Deer (*Central Asia*)	The inspissated and dried secretion from the preputial follicles	Moschus	—	5 to 10 grs.	Stimulant and antispasmodic.
Ovis Aries The Sheep (*Domestic*)	The internal fat of the abdomen	Sevum Præparatum	—	—	Emollient. Used in preparation of Emp. Cantharidis and Ung. Hydrargyri.
Bos Taurus The Ox and Cow (*Domestic*)	*a.* The fresh milk of the cow	Lac	—	—	Used in making Mist. Scammonii.
		Saccharum Lactis	—	—	Vehicle for powders. In Pulv. Elaterini Co.
	b. Fresh ox-bile	Fel Bovinum Purificatum	—	5 to 10 grs.	Tonic. Slightly aperient and cholagogue.

PACHYDERMATA.

Name and Distribution.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
Sus Scrofa The Hog (*Domestic*)	*a.* The purified fat of the abdomen	Adeps Præparatus	—	—	Emollient. An ingredient of the majority of the B. P. ointments.
		Adeps Benzoatus	10 grs. to 1 oz.	—	Emollient. Enters into 4 suppositories and 4 ointments.
		Sapo Animalis	—	—	Used in making Pil. Scammonii Co., Suppos. Morph. cum Sapone, Sup. Acid. Carbolic. cum Sapone, and Sup. Acid. Tannic. cum Sapone.
	b. A preparation of the mucous lining of the stomach	Pepsin*	—	2 to 5 grs.	Aids digestion of nitrogenous food. Given in atonic dyspepsia.

---

* Pepsin may also be prepared from the stomach of the sheep or calf.

Moschus.

Musk is procured from the male musk deer, a small graceful animal, about the size of a roebuck, with no horns. It occurs as irregular, reddish-black, rather unctuous grains, having a strong, peculiar, very diffusible, persistent odour, and a bitter aromatic taste. It is contained in a round or slightly oval membranous sac, about two inches in diameter, situated on the belly of the animal immediately in front of the preputial orifice, and covered on the outer side with stiff grayish hairs arranged in a characteristic concentric manner around its central orifice. Each sac weighs about three-quarters of an ounce, and contains from two to three drachms of musk. Two varieties of musk are imported—China or Thibet musk, and Russian, Siberian, or Kabardine. The latter is an inferior kind.

Musk contains a peculiar odorous principle that has not yet been isolated, as well as ammonia, stearine, elaine, cholesterine, albumen, and different salts. Dried blood and various other substances have been used for the purposes of adulterating it; and artificial pods of musk, made from the skin of the animal, or from that of the musk ox, and stuffed with such substances mixed with a little true musk, have been substituted for the genuine sacs. These false sacs may be recognised by the absence of a central orifice having the characteristic concentric arrangement of the hair round it.

Sevum Præparatum.

Suet is prepared for medicinal purposes by melting the fat and straining it through coarse linen or flannel. Thus purified it is a white, smooth, almost inodorous substance. It is nearly exclusively composed of stearine ($C_3H_53C_{18}H_{35}O_2$), with a little oleine and palmitine, and is fusible at 103°, being the hardest of the solid fats.

Lac.

Cow's milk consists of casein, butter or fat, milk-sugar, various salts—chiefly chlorides and phosphates—and water. Good milk should yield about 12 per cent. of solid matter, and should afford, at least, about 10 per cent. of cream. *Casein* is the nitrogenous constituent of milk, and gives it its chief nutritive value. Although an albuminoid body, casein differs from albumen in being coagulated by acetic acid, forming what is known as "curds." Other acids, and rennet, produce a similar effect. The residue of milk from which the casein has been removed by coagulation, and the cream by standing, is termed "whey."

Saccharum Lactis.

Sugar of milk, or *Lactose* ($C_{12}H_{24}O_{12}$), is a crystallised sugar obtained from the whey of milk by evaporation. It is seen usually in cylindrical masses, 2 inches in diameter, with a cord or stick in the axis, or in fragments of cakes; grayish-white, crystalline on the surface, and in its texture translucent, hard, scentless, faintly sweet, and gritty when chewed. It is slowly soluble in six parts of cold water, but slightly soluble in alcohol, and insoluble in ether. When oxidised with nitric acid it yields mucic acid (a product of gum also when similarly treated) and oxalic acid; saccharic, tartaric, and racemic acids are produced in the same way from it. Sugar of milk differs from grape-sugar in yielding *Galactose* when boiled with dilute acids instead of the isomeric substance *Glucose*. But left for some time in contact with yeast, lactose undergoes alcoholic fermentation, and also resembles glucose in reducing cuprous oxide from an alkaline solution.

Fel Bovinum Purificatum.

The gall of the ox is purified from mucus, etc., by mixing fresh bile (1 pint) and rectified spirit (2 pints) by agitation in a bottle, and setting aside for twelve hours until the sediment—which is chiefly mucin coagulated by the spirit—subsides. The clear spirituous solution is then decanted and evaporated in a porcelain dish by the heat of a water-bath, until it acquires a suitable consistence for making pills.

Purified Ox-Bile is a yellowish-green substance, having a taste partly sweet and partly bitter; it is soluble in water and in spirit.

In addition to mucus and fats, bile consists chiefly of a fatty crystalline substance termed *Cholesterine* ($C_{26}H_{44}O$), certain pigments, a base, *Choline*, and two peculiar conjugate acids called *Glycocholic* and *Taurocholic*, forming crystalline resinous substances resembling soaps, and termed the glycocholate and taurocholate of sodium. *Glycocholic acid* ($C_{26}H_{43}NO_6$) is resolved by the action of sulphuric acid into *Glycocine* ($C_2H_5NO_2$) and *Cholic acid* ($C_{24}H_{40}O_5$). *Taurocholic acid* ($C_{26}H_{45}NSO_7$), by boiling with water, yields *Taurine* ($C_2H_7NO_3S$) and cholic acid.

Pettenkofer's test for bile is as follows:—A solution of one or two grains of ox-bile in about a fluid drachm of water—or any fluid containing bile—when treated, first, with a drop of freshly made syrup consisting of one part of sugar and four of water, and then with sulphuric acid, cautiously added until the precipitate at first formed is redissolved, gradually acquires a cherry-red colour, which changes in succession to carmine, purple, and violet. The liberation of the cholic acid gives the change of colours.

The principal colouring-matter of the bile is *Bilirubin* ($C_{16}H_{18}N_2O_3$), which, on being oxidised, yields *Biliverdin* ($C_{16}H_{20}N_2O_5$); a third pigment, *Bilifuscin* ($C_{10}H_{20}N_2O_4$), is also described. The presence of these pigments in bile may be demonstrated by adding nitric acid, or other oxidising agents (*e.g.*, tincture of iodine), to a solution containing it. The bilirubin is thus converted into biliverdin, giving a green colour which subsequently changes to blue, violet, red, and finally to yellow. This reaction, consequently, serves for the detection not only of bile-pigment but also of bile itself.

The watery solution of purified ox-bile, if the mucus has been thoroughly removed, gives no precipitate on the addition of rectified spirit.

Adeps Præparatus.

Lard is purified by removing the membranes (peritoneum), washing the broken-up masses of fat thoroughly with a current of running cold water, so that whatever is soluble may be thus dissolved and carried away, and straining, then liquefying at a heat not exceeding 212°, so as to avoid any decomposition, and again straining through flannel.

Prepared lard is a soft white fatty substance melting at about 100°. It should not have a rancid odour, and should dissolve entirely in ether. It is a mixture of oleine ($C_3H_53C_{18}H_{33}O_2$) and stearine, the latter being the chief constituent of hard fats (p. 201). Distilled water in which lard has been boiled should not give a precipitate with nitrate of silver (absence of chloride of sodium), and should not give a blue colour with solution of iodine (absence of starch).

Adeps Benzoatus.

Is made by heating in a warm bath for two hours, prepared lard (1 lb.) and coarsely powdered benzoin (160 grs.), and finally straining. Lard is liable to become rancid by absorption of oxygen, and in such a state would be unfit for use. The addition of benzoin prevents or retards this change, and communicates an agreeable odour to the lard.

Sapo Animalis.

Animal or curd soap is made with soda and a purified animal fat (but not necessarily Adeps Præparatus) consisting principally of stearine. The other pharmacopœial soaps are made with olive oil. Curd soap is white, or with a very light grayish tint, dry, nearly inodorous; horny and pulverisable when kept in dry warm air; easily moulded when heated; soluble in rectified spirit; soluble also in hot water, the solution being neutral or only slightly alkaline to test-paper. It does not impart a greasy stain to paper, and may, with advantage, be substituted for the hard soap made with olive oil in preparing the Linimentum Potassii Iodidi cum Sapone.

Pepsin.

A nitrogenous substance existing in the gastric juice and in the peptic gastric glands. It is prepared from the mucous lining of a fresh and healthy stomach of pig, sheep, or calf, by the following process:—

The stomach of one of these animals recently killed having been cut open and laid on a board with the inner surface upwards, any adhering portions of food, dirt, or other impurity are to be removed, and the exposed surface slightly washed with cold water; the cleansed mucous membrane is then to be scraped with a blunt knife or other suitable instrument, and the viscid pulp thus obtained is to be immediately spread over the surface of glass or glazed earthenware, and quickly dried at a temperature not exceeding 100° F., as a higher temperature would destroy its digestive powers. The dried residue is reduced to powder, and preserved in a stoppered bottle.

Pepsin is a light yellowish-brown powder, having a faint but not disagreeable odour, and a slightly saline taste, without any indication of putrescence; very little soluble in water or spirit. Its efficacy depends upon its solvent powers on albuminous bodies, which, in the presence of dilute hydrochloric acid, it converts into peptones. The quality of a specimen is consequently ascertained by the following test :—Two grains of it with an ounce of distilled water, to which five minims of hydrochloric acid have been added, form a mixture in which 100 grains of hard-boiled white of egg, passed through wire gauze of 36 meshes per linear inch and made of No. 32 brass or copper wire, will dissolve on their being well mixed, digested, and stirred together for thirty minutes at a temperature of 130° F.

Commercial pepsin is often impure; but almost, if not quite, all kinds of pepsin deteriorate by keeping, independently of adulteration.

CETACEA.

Name and Distribution.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
PHYSETER MACROCEPHALUS The Sperm Whale (*Pacific and Indian Oceans*)	Cetine, mixed with oil from the head	Unguent. Cetacei	—	—	An emollient application. Contained in Charta Epispastica.

Cetaceum.

Spermaceti is obtained in large quantities from the cavities in the head of the sperm whale. It is separated from the sperm oil, with which it is mixed, by filtration, and afterwards purified by melting and straining. It is a crystalline, pearly-white, glistening, translucent, fatty substance, with little taste or odour, reducible to powder by the addition of a little rectified spirit; scarcely unctuous to the touch, and should not melt under 110° F. If softer fats, such as lard or suet, were present, the melting-point would be lower. The latter, like most of the hard or solid fats, consist, as has been shown (pp. 201, 298), chiefly of stearine. Spermaceti consists of nearly pure cetine. Stearine, like oleine, when brought together with a moist alkaline oxide or hydrate, forms, by a simple double decomposition, a soap and glycerine. Cetine, however, which is chemically known as the *palmitate of cetyl*, differs from stearine and oleine in yielding, instead of glycerine, when saponified, a substance called *ethal*. Ethal is the hydrate of cetyl, and is an alcohol homologous with ordinary alcohol.

Spermaceti is soluble in fixed and volatile oil, and in fats.

CLASS AVES.

RASORES (GALLINÆ).

Name and Distribution.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
GALLUS BANKIVA The Common Fowl *Domestic*)	The egg	Ovi Albumen	—	—	Demulcent.
		Solution of (App. II.)	—	—	Test for freedom of Acid. Phosphoric. — Dil. from Metaphosphoric acid: it precipitates the latter.
		Ovi Vitellus	—	—	An ingredient in Mist. Spirit. Vini Gallici. Used for making emulsions.

Ovi Albumen.

Egg Albumen, or the liquid white of the egg, differs from serum (blood) albumen in being coagulable by ether. A solution of albumen in cold water is coagulated by solutions of corrosive sublimate, and many other metallic salts, by nitric, sulphuric, hydrochloric, and tannic acids, and by heating over 180°. It is not precipitated by acetic acid, thus differing from casein.

Ovi Vitellus.

Yolk of egg consists of a mixture of albumen and casein (*vitelline*), and a yellow oil containing phosphoric acid.

CLASS PISCES.

TELEOSTEI (ANACANTHINI).

Name and Distribution.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
ACIPENSER The Sturgeon (*Black Sea and Caspian*)	The swimming-bladder or sound	Isinglass (App. II.) Solution of Gelatine (App. III.)	— 10 grs. in 1 oz.	— —	Used for making Sol. of Gelatine. Test for Tannic acid.
GADUS MORRHUA The Cod (*Coasts of Newfoundland, etc.*)	The oil extracted from the fresh liver	Oleum Morrhuæ	—	1 to 8 drms.	Nutritive. Affords an easily assimilated fat. Beneficial in struma, phthisis, defective nutrition, etc.

Isinglass.

The swimming-bladder or sound of various species of sturgeon, prepared, cut into shreds, and dried. It consists almost entirely of pure *gelatine* (9 per cent.); it is soluble in warm water, but gelatinises on cooling; insoluble in alcohol and ether. From its aqueous solution gelatine is precipitated by alcohol, corrosive sublimate, perchloride of platinum, and by tannic acid—the latter forming leather. A solution of gelatine in water is not, like one of albumen, coagulated by heat. By prolonged boiling the gelatinous power on cooling is destroyed.

Oleum Morrhuæ.

Is prepared from the fresh liver of the cod by the application of a heat not exceeding 180° F. It contains glycerine, oleic, margaric, butyric, and acetic acids, a peculiar substance called gaduin, morrhuol, various biliary principles due to the hepatic source of the oil, iodine in small quantities, traces of bromine, chlorine, phosphorus, and salts. A volatile alkaloid, *Propylamine* ($NH_2C_3H_7$), can be obtained by distilling the oil with alkalies. It is stated that the fats of this oil are not true glycerides, but are salts of *Propyl* (C_3H_7), and yield *Propyl hydrate* (C_3H_7HO) on saponification instead of glycerine (Muter). The best ("pale") oil is of a pale-yellow colour, with a slight fishy odour, and bland fishy taste. The darker-coloured light and dark-brown oils are of an inferior quality and have a more nauseous taste. When a drop of sulphuric acid is added to a few drops of the oil on a porcelain plate, the play of colours due to the presence of cholic acid in bile is produced (p. 297). This test shows that the oil must have been made from the *liver*, and hence contains some bile; but it does not prove the genuineness of the oil or demonstrate that it is derived from codfish. Any liver oil would give the same reaction.

CLASS INSECTA.

HYMENOPTERA.

Name and Distribution.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
APIS MELLIFICA The Hive Bee (*Domestic*)	*a.* Saccharine secretion deposited in the honeycomb.	Mel	—	—	Demulcent, slightly laxative.
		Mel Depuratum	—	—	Used in making the confections of pepper, scammony, and turpentine.
		Mel Boracis	64 grs. of borax to 1 oz.	—	Detergent and astringent. Useful application to aphthæ.
		Oxymel	40 pts. in 50	1 to 2 drms.	Demulcent. Chiefly used in gargles for sore throat, and to make oxymel scillæ.
	b. The prepared honeycomb.	Cera Flava Unguent. Simplex	—	—	Contained in several ointments and plasters.
		Cera Alba	—	—	Contained in Charta Epispastica, Ung. Cetacei, and in Ung. Simplex.

Mel, Mel Depuratum.

Honey, when recently separated from the honey-comb, is a viscid translucent liquid, of a brownish-yellow colour, which gradually becomes partially crystalline and opaque, owing to the separation of glucose in crystals. It has a peculiar heavy odour and a very sweet taste. (*Vide* "Mellita," Part II.)

Honey consists of three distinct kinds of sugar—Sucrose, Glucose, and Lævulose—present in varying proportions, mixed with odorous, colouring, gummy, and waxy matters, and water. *Glucose*, dextrose, or grape-sugar ($C_6H_{12}O_6,H_2O$) constitutes the largest proportion, and forms the solid crystalline portion of honey. It is less sweet than cane-sugar, and less soluble in water and in alcohol. In common with Lævulose, it is distinguished from cane-sugar by at once precipitating red cuprous oxide when boiled with an alkaline solution of a cupric salt (p. 291).

Lævulose or fruit-sugar ($C_6H_{12}O_6$) is a mixture of glucose and sucrose in equivalent quantities. It is also known as inverted sugar. Its name is derived from the fact that its solution turns a ray of polarised light to the left. Solutions of cane and grape-sugar have an opposite effect. Lævulose is not crystallisable, and in other respects it has the same reactions as glucose.

Honey is adulterated with starch. If boiled with water for five minutes and allowed to cool, it does not, if free from starch, become blue with solution of iodine. Glucose, made from starch, and cane-sugar are also sometimes fraudulently added.

Cera Flava, Cera Alba.

The comb left after the removal of the honey is melted in boiling-water, and then cooled. Thus prepared, it constitutes Prepared or Yellow Wax—a firm substance breaking with a granular fracture, yellowish, and having an agreeable honey-like odour. It should not be unctuous to the touch; if it were, its adulteration with suet might be suspected. It does not melt, if pure, under 140°; yields nothing to cold rectified spirit (absence of resin), but is entirely soluble in oil of turpentine (absence of insoluble impurities). Freedom from adulteration with starch is shown by boiling water in which it has been agitated, when cooled, not being rendered blue by the addition of solution of iodine.

White Wax is procured by bleaching yellow wax by exposing it to moisture, air, and light. It is hard, nearly white, and translucent. If too white, adulteration with spermaceti would be indicated. Adulteration with tallow, suet, or lard may be detected by its not being unctuous to the touch, and by the melting-point, which is 10° higher than that of yellow wax.

Bee's Wax is a mixture of *Cerotic Acid* or *Cerotin*, soluble in boiling alcohol; *Palmitate of Melissyl* or *Myricine*, insoluble in boiling alcohol, but deposited on cooling; and *Ceroleine*, a body to which the colour, odour, and tenacity of wax are due (Attfield).

COLEOPTERA.

Name and Distribution.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
CANTHARIS VESICATORIA Cantharides or Spanish Fly (*Hungary*)	The Beetle, dried	Acet. Cantharidis	2 oz. to 1 pt.	—	Externally rubefacient and vesicant. Internally a stimulating diuretic, Emmenagogue, Aphrodisiac (?), and spinal stimulant. Given in cases of chronic paraplegia, incontinence of urine, and in gleet.
		Empl. Cantharidis	1 pt. in 3	—	
		Tinct. Cantharidis	5½ grs. to 1 oz.	5 to 20 mins.	
		Ung. Cantharidis	1 pt. in 8	—	
		Charta Epispastica	—	—	
		Liquor Epispasticus	1 in 4	—	
		Collodium Vesicans	1 in 4 (nearly)	—	
		Empl. Calefaciens	1 in 24	—	

Cantharides.

A small beetle, in the dried state from eight to ten lines long, furnished with two wing-covers (*elytræ*) of a shining metallic-green colour, under which are two membranous transparent wings; odour strong and disagreeable. The powder is grayish-brown, containing shining green particles of the elytræ, and should be free from mites. About May or June the insects swarm upon trees, especially the ash, privet, and lilac, and are collected by shaking the branches and catching them in sheets. They are then killed by being plunged into boiling vinegar, and subsequently dried.

Cantharides contain oil and fatty principles, green and yellow colouring matters, and a solid crystalline body—the active principle—termed *Cantharidine* ($C_5H_6O_2$). This occurs in white, micaceous, fusible scales. It is volatile, inodorous, and tasteless; insoluble in water, and nearly so in cold alcohol and in disulphide of carbon; soluble in ether, chloroform, glacial acetic acid, solution of potash and of soda, and in fixed oils. Pure isolated cantharidine, although insoluble, as above stated, in water and cold alcohol, as it exists in the beetle is partly soluble in these menstrua, perhaps in consequence of its being united with some other constituent of the insect—*e.g.*, the yellow colouring matter. The green colouring matter is said to consist of *chlorophyll*, derived from the plants on which the insects feed.

HEMIPTERA.

Name and Distribution.	Part Used.	B. P. Preps.	Strength.	Dose.	Action and Use.
COCCUS CACTI The Cochineal Insect (*Mexico and Teneriffe*)	The dried female insect	Tinct. Cocci	2½ ozs. to 1 pt.	—	Colouring agent. The powder is contained in Tinct. Cardamom. Co., and in Tinct. Cinchonæ Co.

Coccus.

The cochineal insects are reared on plantations of the Nopal cactus (Opuntia cochinillifera) and when the female insects become fecundated by the male, the former are swept off the trees, killed by immersion in boiling water, and then dried. The male insects are smaller, and much fewer in proportion numerically, than the female, and are not collected.

The dried insect is ovate, plano-convex, about two lines long, wrinkled, black or grayish-white. It yields, when crushed, a puce-coloured powder. The colouring matter of cochineal is a dibasic acid, termed *Carminic Acid* or *Carmine* ($C_{14}H_{14}O_8$). The grayish-white colour of one variety of the insect—silver cochineal—said to be the impregnated female, is due to a whitish powder which quickly becomes black when warmed before the fire. Black cochineal is said to be the female exhausted by propagation.

Various heavy white powders have been found dusted over cochineal, with the view of increasing its weight.

CLASS ANNELIDA.

HIRUDINEA.

Hirudo.

Two species of leeches are particularized in the Pharmacopœia—1. The Speckled Leech, Sanguisuga officinalis; and 2. The Green Leech, S. medicinalis. Leeches are collected in Spain, France, Italy, and Hungary. The body of each variety is elongated, two or three inches long, tapering to a disk or sucker at each end, plano-convex, and, being composed of projecting rings, wrinkled transversely; back olive-green, with six rusty-red longitudinal stripes. The speckled leech is so called from having a greenish-yellow belly spotted with black. The belly of the green leech is of an olive-green colour and not spotted. The mouth is triradiate, and contains three cartilaginous jaws, each of which is furnished with a double row of numerous sharp-cutting teeth. A leech draws from one to two drachms of blood.

PART II.

PHARMACY.

THE PHARMACOPŒIAL PREPARATIONS.

DILUTE ACIDS.

Acidum Aceticum Dilutum.
,, Hydrobromicum Dilutum.
,, Hydrochloricum Dilutum.
,, Lacticum Dilutum.
,, Nitricum Dilutum.
,, Nitro-hydrochloricum Dilutum.
,, Sulphuricum Dilutum.
,, Sulphuricum Aromaticum.
,, Phosphoricum Dilutum.
,, Hydrocyanicum Dilutum.

All these preparations, with the exception of the two latter, may be conveniently grouped together as *Dilute Acids, whose neutralising power is measured by the amount of the Volumetric Solution of Soda they are capable of saturating.*[*]

Aromatic Sulphuric Acid is in reality a Dilute Acid, and as such is included in the accompanying table.

The first six members of this group may be contrasted in a tabular form, as follows :—

[*] 1,000 grain-measures of the Volumetric Solution of Soda contain one equivalent in grains (40) of $NaHO$, and will therefore neutralise an equivalent quantity of any acid. All the dilute mineral acids are prepared so as to be of the same neutralising power—six fluid drachms of each corresponding to one equivalent of the real acid, and hence requiring for neutralisation 1,000 grain-measures of the Volumetric Solution of Soda.

Acid.	Preparation.	Neutralisation.	Percentage Strength.	Sp. Gr.
Acidum Aceticum Dilutum	Dilute 1 pt. of Acetic Acid with 7 parts of distilled water	One fluid oz. requires 313 grain-measures of the Volumetric Solution of Soda, and therefore corresponds to 16 grains of real acetic acid ($C_4H_6O_3$)	4·27 per cent. of real acid	1·006
Acidum Hydrochloricum Dilutum	Dilute 8 parts of Hydrochloric Acid with distilled water until the mixture measures 26½ parts at 60° F.	Six fluid drachms require 1,000 grain-measures of the Volumetric Solution of Soda, and therefore correspond to 36½ grains (or one equivalent) of Hydrochloric Acid.	10·58 per cent. of real acid	1·052
Acidum Lacticum Dilutum	Dissolve 3 parts of Lactic Acid in sufficient distilled water to produce 20	800 grains by weight require 1,000 grain-measures of the Volumetric Solution of Soda	11·25 per cent. of real acid	1·040
Acidum Nitricum Dilutum	Dilute 6 parts of Nitric Acid with distilled water until the mixture measures 31 parts at 60° F.	Six fluid drachms require 1,000 grain-measures of the Volumetric Solution of Soda, and therefore correspond to 54 grains (or half an equivalent) of nitric anhydride (N_2O_5)	17·44 per cent. of real acid	1·101
Acidum Nitro-hydrochloricum Dilutum	Mix 3 parts of Nitric Acid with 4 of Hydrochloric Acid, and add 25 parts of distilled water in successive portions; to be kept in a stoppered bottle 14 days before use.	Six fluid drachms require 883 grain-measures of the Volumetric Solution of Soda	—	1·07
Acidum Sulphuricum Dilutum	Dilute 7 parts of Sulphuric Acid gradually with distilled water until the mixture measures 83½ parts at 60° F.	Six fluid drachms require 1,000 grain-measures of the Volumetric Solution of Soda, and therefore correspond to 40 grains (or half an equivalent) of anhydrous acid (SO_3)	10·14 per cent. of anhydrous acid	1·094
Acidum Sulphuricum Aromaticum	Mix 3 ozs. of Sulphuric Acid gradually with 36 fluid ozs. of rectified spirit, and add to this mixture 2 fluid ozs. each of Spirit of Cinnamon and strong Tincture of Ginger.	195 grains by weight require 500 grain-measures of the Volumetric Solution of Soda, and therefore correspond to 20 grains of anhydrous acid.	10·91 per cent. of anhydrous acid	0·911

Acidum Hydrobromicum Dilutum, *Acidum Hydrocyanicum Dilutum* and *Acidum Phosphoricum Dilutum* have been considered in Part I. (pp. 10, 11, and 29).

ACETA (VINEGARS).

These are :—

Acetum.
,, Scillæ.
,, Cantharidis.

Acetum (British Vinegar).

Is now defined as "an acid liquid prepared from malt and unmalted grain by acetous fermentation." The following formula illustrates the theory of *acetification* :—

$$\underbrace{C_2H_6O}_{\text{Alcohol.}} + O_2 = \underbrace{C_2H_4O_2}_{\text{Acetic Acid.}} + H_2O$$

It will thus be seen that the alcohol is converted by the absorption of oxygen from the atmosphere into acetic acid and water. The process of acetification is rapidly effected by allowing the fermenting liquor to trickle slowly through wood-shavings contained in tall vats. A large surface is thus exposed to the air which circulates through small side-holes pierced near the bottom of the vessels.

British vinegar contains 4·6 per cent. of anhydrous acetic acid. One fluid oz (445·4 grains by weight) requires for neutralisation 402 grain-measures of the Volumetric Solution of Soda. Its specific gravity ranges from 1·017 to 1·019.

Sulphuric acid acts as a preservative of vinegar, and hence the presence of $\frac{1}{1000}$ part is legally permitted. The following test indicates that the lawful proportion of sulphuric acid is not exceeded :—The precipitate afforded by the addition of 10 minims of solution of chloride of barium to 1 oz. of vinegar having been removed by filtration, the further addition of solution of chloride of barium will give no precipitate.

The only Pharmacopœial compound in the preparation of which vinegar is employed is the Emplastrum Saponis Fuscum.

Acetum Cantharidis.

Preparation.—Digest 2 oz. of powdered cantharides in a mixture of 2 oz. of glacial acetic acid, with 13 oz. of acetic acid, for 2 hours, at 200° F. When cold, place them in a percolator, and when the fluid no longer drops, pour 5 oz. of acetic acid over the residuum. When percolation is completed, press and make up the bulk of the liquid to 20 oz. with acetic acid. Sp. Gr., about 1·060.

Acetum Scillæ.

Preparation.—Macerate 2½ oz. of squills in 20 oz. of dilute acetic acid for seven days, strain with expression, and filter.

It must be borne in mind that these so-called "vinegars" are solutions of the active principles *not in vinegar*, but in very strong acetic acid, in the case of *Acetum Cantharidis*, and in dilute acetic acid, in the case of *Acetum Scillæ.*

Heat is employed in the preparation of Acetum Cantharidis, as it promotes the solution of the active principle, *Cantharidine.*

Acetum Scillæ enters into the composition of Oxymel Scillæ and Syrupus Scillæ.

AQUÆ (WATERS).

The waters are fifteen in number, namely :—

Aqua.
„ Destillata.
„ Camphoræ.
„ Chloroformi.
„ Aurantii Floris.
„ Menthæ Piperitæ.
„ Menthæ Viridis.

Aqua Rosæ.
,, Sambuci.
,, Laurocerasi.
,, Cinnamomi.
,, Anethi.
,, Anisi.
,, Carui.
,, Fœniculi.
,, Pimentæ.

Aqua (H_2O).—The purest natural water that can be obtained, cleared, if necessary, from substances *mechanically suspended* in it by filtration. It should be free from taste, odour, and visible impurity.

The most common impurities of natural waters are saline matters, as sulphate of lime, carbonate of lime (held in solution by excess of carbonic acid, and conferring on water the property of "hardness"), etc., besides gases. Water is termed "hard" or "soft" according to its action on soap. In hard waters the contained earth (lime or magnesia) combines with the fatty acid of the soap, forming a substance insoluble in water. Hard waters may be rendered soft by boiling, by which means carbonic acid is driven off, and the carbonate of lime which was held in solution by it is deposited.

The amount of hardness destroyed by boiling is termed "*temporary* hardness," as distinguished from the permanent hardness due to soluble salts of lime and magnesia, which still remain in boiled water.

Professor Clark, the inventor of the soap test for measuring the hardness of water, proposed, as a means for softening water containing carbonate of lime, the addition of sufficient lime-water to unite with the free carbonic acid. The carbonate of lime thus formed, together with that already existing in the water, is deposited, and three-fourths of the hardness of the water is removed.

"Mineral Waters" are those which hold in solution saline or gaseous substances, whence they derive medicinal properties. There are four classes of them, viz.:—Class 1. *Carbonated*, containing much carbonic acid, and usually saline carbonates, on which the carbonic acid acts as a solvent (Carlsbad, Seltzer, Ilkstone, etc.). Class 2. *Chalybeate*, containing carbonate of iron (Harrogate, Pyrmont, Spa, Tunbridge Wells, etc.), and sulphate of iron (Brighton, etc.). Class 3. *Saline*, of which there are several varieties—*calcareous*, containing carbonate and sulphate of lime (Bath, Bristol, etc.); *alkaline*, containing alkaline carbonates (Ems, Vichy, etc.); *purging saline*, containing sulphates of magnesia and soda (Cheltenham, Friederichshall, Seidlitz, etc.); and *salt*, containing chlorides, and sometimes traces of iodine and bromine (sea-water, Baden-Baden, Kreutznach, Wiesbaden, etc.). Class 4. *Sulphuretted*, containing sulphuretted hydrogen (Aix-la-Chapelle, Cheltenham, Harrogate, etc.).

Aqua Destillata.—Prepared by distilling 10 gallons of water from a copper still. All the volatile impurities come over with the first half-gallon, and hence this is to be rejected. On the other hand, the distillation is not to be continued after 8 gallons have passed over, lest empyreumatic matters (resulting from the charring of the organic impurities) might contaminate the product.

The tests for the purity of distilled water are:—

1. No residue on evaporation = absence of fixed impurities.
2. Not affected by *sulphuretted hydrogen* = absence of metallic impurities.
3. Not affected by *oxalate of ammonium* = absence of salts of lime.
4. Not affected by *nitrate of silver* = absence of chlorides.
5. Not affected by *chloride of barium* = absence of sulphates.
6. Not affected by *solution of lime* = absence of carbonic acid.

The remaining Aquæ may be conveniently divided into four classes, according to their method of preparation, as follows:—

CLASS 1.

Prepared by simple solution in distilled water.

Aqua Camphoræ (½ oz. to 1 gallon) was formerly "Mistura Camphoræ."

Aqua Chloroformi (1 drachm to 25 oz.).

CLASS 2.

Prepared by distillation of the flowers.

Aqua Aurantii Floris.—Made mostly in France, and apt to contain lead from being imported in leaden vessels; it is hence directed to be tested with sulphuretted hydrogen.

CLASS 3.

Prepared by distillation of the volatile oil with water (1½ drachms of oil to 1½ gallons, distil 1 gallon = 1 of oil in 853).

Aqua Menthæ Piperitæ.
Aqua Menthæ Viridis.

CLASS 4.

Prepared by distillation of part of the plant with water.

160 oz. to 2 gallons, distil 1 gallon = 1 in 1.	*Aqua Rosæ* (fresh petals). *Aqua Sambuci* (fresh flowers).
16 oz. to 2½ pints, distil 1 pint = 1 in 1¼.	*Aqua Laurocerasi* (fresh leaves).
20 oz. to 2 gallons, distil 1 gallon = 1 in 8.	*Aqua Cinnamomi* (bark).
16 oz. to 2 gallons, distil 1 gallon = 1 in 10.	*Aqua Anethi.* *Aqua Anisi.* *Aqua Carui.* *Aqua Fœniculi* (dried fruit).
14 oz. to 2 gallons, distil 1 gallon = 1 in 11½.	*Aqua Pimentæ* (dried unripe berries).

In the preparation of Aqua Laurocerasi the crushed fresh leaves are directed to be macerated in the water for 24 hours before distilling. It is not a preparation of reliable strength.

The following are the officinal compounds into the composition of which the Aquæ enter :—

Aqua Camphoræ in Injectio Apomorphinæ Hypodermica, Injectio Ergotini Hypodermica, and Liquor Atropinæ Sulphatis.

Aqua Floris Aurantii in Syrupus Floris Aurantii; *Aqua Cinnamomi* in Mistura Cretæ, Mistura Guaiaci, and Mistura Spiritus Vini Gallici; *Aqua Menthæ Piperitæ* in Mistura Ferri Aromatica; *Aqua Rosæ* in Mistura Ferri Composita and in Trochisci Bismuthi.

CATAPLASMATA (POULTICES).

These are :—

Cataplasma Carbonis.
,, Conii.
,, Fermenti.
,, Lini.
,, Sinapis.
,, Sodæ Chlorinatæ.

A poultice consists of three parts—namely, the "liquor" (the fluid part), the "corpus" (the basis or bulk of the poultice), and the "accessorium" (the active medicinal ingredient). In the following Table of the Cataplasms the substances which constitute these parts respectively will be seen :—

	"Liquor."	"Corpus."	"Accessorium."	Directions for Preparation.
Cataplasma Fermenti	Water at 100° F. (6 ozs.)	Flour (14 ozs.)	Beer Yeast (6 ozs.)	Mix the yeast with the water, and stir in the flour. Place the mass near the fire till it rises.
Cataplasma Carbonis	Boiling Water (10 ozs.)	Bread (2 ozs.) Linseed Meal (1½ ozs.)	Wood Charcoal (½ oz.)	Soak the bread in the water near the fire, and, while stirring, add the linseed meal, and then half the charcoal. Sprinkle the remainder of the charcoal over the surface.
Cataplasma Conii	Boiling Water (10 ozs.)	Linseed Meal (4 ozs.)	Juice of Hemlock (1 oz.)	Evaporate the juice to half its volume, add this to the linseed meal and water previously mixed, and stir them together.
Cataplasma Sinapis	Boiling Water (10 ozs.)	Linseed Meal (2½ ozs.)	Mustard (2½ ozs.)	Mix the linseed meal gradually with the water, and add the mustard, with constant stirring.
Cataplasma Lini	Boiling Water (10 ozs.)	Linseed Meal (4 ozs.) Olive Oil (½ oz.)	—	Mix the linseed meal gradually with water, and add the remaining ingredient, constantly stirring.
Cataplasma Sodæ Chlorinatæ	Boiling Water (8 ozs.)	Linseed Meal (4 ozs.)	Solution of Chlorinated Soda (2 ozs.)	Mix the linseed meal gradually with the water, and add the solution of chlorinated soda, with constant stirring.

On reference to this table it will be noticed that in every case, except in that of *C. Fermenti,* boiling water is the "liquor" used. If water at a higher temperature than 100° were employed in the preparation of *C. Fermenti,* the catalytic process which takes place would be materially interfered with. It will also be seen that, except in *C. Fermenti* and *C. Sodæ Chloratæ,* the quantity of water used is 10 oz.

The "corpus" in the case of *C. Fermenti* is flour; in *C. Carbonis* it is bread and linseed meal; and in every other case it is linseed meal only. In *C. Lini* olive oil is used to replace the natural oil which is lost in the preparation of the meal.

The following are the strengths of the Cataplasms :—

Cataplasma	Fermenti	1 in 4½
„	Sinapis	1 in 6
„	Lini	1 in 3½
„	Sodæ Chloratæ	1 in 7
„	Conii	1 in 14
„	Carbonis	1 in 28

It will be observed that the strength of each of the last three poultices is half that of the preceding one.

CHARTÆ (PAPERS).

There are two of these in the Pharmacopœia, viz. :—

Charta Epispastica.
„ Sinapis.

Charta Epispastica, or "Blistering Paper," is prepared by digesting 4 oz. of white wax, 1½ oz. of spermaceti, 2 oz. of olive oil, ¾ oz. of resin, 1 oz. of cantharides, and 6 oz. of distilled water, in a water-bath for two hours, stirring them constantly, and then straining. Mix ¼ oz. of Canada balsam with the melted plaster, and pass strips of paper over the surface of the hot liquid.

Charta Sinapis.—Mix 1 oz. of powdered black mustard with sufficient gutta-percha solution to form a semi-fluid mixture; pour this into a shallow vessel, and float slips of cartridge-paper over the surface of the fluid, so that they shall receive a thin coating of it on one side; expose them to the air until the coating hardens.

The mustard-paper should be immersed for a few seconds in tepid water before application. This is an imitation of Rigollot's mustard leaves.

CONFECTIONES (CONFECTIONS).

There are eight of these in the Pharmacopœia, viz. :—

Confectio Opii.
„ Piperis.
„ Rosæ Caninæ.
„ Rosæ Gallicæ.
„ Scammonii.
„ Sennæ.
„ Sulphuris.
„ Terebinthinæ.

Confections are preparations of the consistence of a solid, in which medicinal substances are incorporated with saccharine matter, with a view either to their preservation or more convenient administration.

The ingredients, strength, and directions for preparation of the officinal Confections are tabulated as follows :—

	Strength.	Ingredients.	Directions for Preparation.
CONFECTIO OPII	1 in 40 nearly	Compound Powder of Opium . . 192 grs. Syrup . . . 1 oz.	Mix.
CONFECTIO PIPERIS	1 in 10	Powdered Black Pepper . . . 2 „ Powdered Caraway . 3 „ Clarified Honey . 15 „	Triturate well together in a mortar.
CONFECTIO ROSÆ CANINÆ	1 in 3	Hips (deprived of seeds) . . . 1 lb. Refined Sugar . . 2 „	Beat the hips to a pulp in a stone mortar, rub the pulp through a sieve, add the sugar, and rub well together.
CONFECTIO ROSÆ GALLICÆ	1 in 4	Red Rose Petals (fresh) . . . 1 „ Refined Sugar . . 3 „	Beat the petals to a pulp in a stone mortar, add the sugar, and rub well together.
CONFECTIO SULPHURIS	1 in 2¼	Sublimed Sulphur . 4 ozs. Acid Tartrate of Potash . . . 1 „ Syrup of Orange Peel 4 „	Triturate well together in a mortar.

CONFECTIONES (CONFECTIONS) (*continued*).

	Strength.	Ingredients.	Directions for Preparation.
CONFECTIO SCAMMONII	1 in 3	Resin of Scammony . 3 oz. Powdered Ginger . 1½ ,, Oil of Caraway . . 1 drm. Oil of Cloves . . ½ ,, Syrup . . . 3 oz. Clarified Honey . 1½ ,,	Rub the powders with the syrup and honey, add the oils, and mix.
CONFECTIO SENNÆ	1 in 11	Powdered Senna . 7 ,, Powdered Coriander 3 ,, Figs . . . . 12 ,, Prunes . . . 6 ,, Tamarinds . . 9 ,, Cassia Pulp . . 9 ,, Extract of Liquorice 3½ ,, Refined Sugar . . 30 ,, Distilled Water . 24 ,,	Boil the figs and the prunes gently for four hours with 24 ozs. of water, add the tamarinds and cassia pulp; digest for two hours, and press the pulp through a hair sieve; dissolve the sugar and liquorice in the pulped product by a gentle heat, and add the senna and coriander. The result should weigh 75 ozs.
CONFECTIO TEREBINTHINÆ	nearly 1 in 4	Oil of Turpentine . 1 ,, Powdered Liquorice Root . . . 1 ,, Clarified Honey . 2 ,,	Rub the oil of turpentine with the liquorice root, add the honey, and mix.

Confectio Piperis is intended as a substitute for "Ward's Paste." *Confectio Rosæ Caninæ* enters into the composition of Pilula Quiniæ, and *Confectio Rosæ Gallicæ* into that of the following pill-masses:—Aloes Barbadensis, Aloes Socotrinæ, Aloes et Asafœtidæ, Aloes et Ferri, Ferri Carbonatis, Hydrargyri, and Plumbi cum Opio.

DECOCTA (DECOCTIONS).

There are fourteen formulæ for the preparation of Decoctions, viz.:—

Decoctum Aloes Compositum.
,, Cetrariæ.
,, Cinchonæ.
,, Granati Radicis.
,, Hæmatoxyli.
,, Hordei.

Decoctum Papaveris.
„ Pareiræ.
„ Quercûs.
„ Sarsæ.
„ Sarsæ Compositum.
„ Scoparii.
„ Taraxaci.

Decoctions are watery solutions of the active principles of vegetables obtained by boiling.

The process of decoction is unsuitable in the case of vegetables whose active principles are volatile.

The length of time prescribed for boiling (in a covered vessel) varies, and is proportionate to the solubility of the active matter. It is ten minutes in every case, with the exceptions of *Decoctum Aloes Compositum* (5 minutes). *Decoctum Pareiræ* (15 minutes), and *Decoctum Hordei* (20 minutes). *Decoctum Granati Radicis* is boiled from 2 pints to 1 pint.

Infusion is more effective than decoction as a means of abstracting the principles of sarsaparilla; hence in *Decoctum Sarsæ* and in *Decoctum Sarsæ Compositum* the solid ingredients are directed to be *digested in boiling water* for one hour before being boiled in it.

The majority of the Decoctions are ordered to be *strained while hot*, as a deposit of active matter occasionally takes place when the preparation becomes cold. The exceptions to the rule are *Decoctum Aloes Compositum*, *Decoctum Sarsæ*, and *Sarsæ Compositum*, which are to be strained *when cool*, and *Decoctum Cinchonæ*, which is to be strained *when cold*.

In every case, except that of *Decoctum Hordei*, after straining, as much distilled water is directed to be poured over the contents of the strainer as will make the strained product measure 1 pint. In the case of *Decoctum Aloes Compositum* the strained product is made up to 30 fluid oz.

In *Decoctum Cetrariæ* and *Decoctum Hordei* the moss and the barley, respectively, are directed to be washed with cold water before boiling—in the former case to remove any impurities, and in the latter case to remove any mustiness or disagreeable flavour.

All the Decoctions are simple, excepting *Decoctum Aloes Compositum* and *Decoctum Sarsæ Compositum.* It must, however, be remembered that although *Decoctum Hæmatoxyli* is a simple decoction, 60 grains of powdered cinnamon bark are directed to be used in its preparation.

The following table shows the strengths of the Decoctions :—

2½ ozs. to 1½ pnts.	*D. Sarsæ* *D. Sarsæ Co.*	=1 in 8
2 ozs. to 2 pnts.	*D. Granati Rad.*	=1 in 10
1½ ozs. to 1 pnt.	*D. Pareiræ*	=1 in 14
2 ozs. to 1½ pnts.	*D. Papaveris* *D. Hordei*	=1 in 15
1¼ ozs. to 1 pnt.	*D. Cinchonæ* *D. Quercus*	=1 in 16
1 oz. to 1 pnt.	*D. Scoparii* *D. Cetrariæ* *D. Taraxaci* *D. Hæmatoxyli*	=1 in 20
½ oz. to 2½ pnts.	*D. Aloes Co.*	=1 in 100

The ingredients of the compound Decoctions are as follows :—

D. Aloes Comp.	*D. Sarsæ Comp.*
Extract of Socotrine Aloes, 120 grs.	Jamaica Sarsaparilla, 2½ ozs.
Myrrh, 60 grs.	Sassafras, ¼ oz.
Saffron, 60 grs.	Guaiacum Wood, ¼ oz.
Carbonate of Potassium, 60 grs.	Liquorice Root, ¼ oz.
Extract of Liquorice, 1 oz.	Mezereon Bark, 60 grs.
Compound Tincture of Cardamoms, 7½ ozs.	Boiling Distilled Water, 30 ozs.
Distilled Water, ad 25 ozs.	

The use of the carbonate of potassium in the preparation of *Decoctum Aloes Compositum* is to render the aloes and the resin of the myrrh more soluble in water. The extract of liquorice is useful for aiding in the suspension of the undissolved substances, while the compound tincture of cardamoms acts to a certain extent as a preventive of decomposition.

The *Decoctum Sarsæ Compositum* is an imitation of the "Lisbon diet drink."

In the former formula for the preparation of *Decoctum Papaveris* the seeds of the capsules were ordered to be rejected. The seeds are now *retained*, for it is found that their oil, which is suspended in water by the mucilage of the capsules, enhances the medicinal effects of the decoction.

EMPLASTRA (PLASTERS).

There are fourteen official Plasters, viz :—

Emplastrum Ammoniaci cum Hydrargyro.
,, Belladonnæ.
,, Calefaciens.
,, Cantharidis.
,, Ferri.
,, Galbani.
,, Hydrargyri.
,, Opii.
,, Picis.
,, Plumbi.
,, Plumbi Iodidi.
,, Resinæ.
,, Saponis.
,, Saponis Fuscum.

Plasters are external applications, adhesive at the temperature of the body, and employed either to afford mechanical support or to convey medicinal effects.

For the directions for the preparation of the individual Plasters, reference must be made to the Pharmacopœia.

The following table shows the constitution of ten of the Emplastra :—

Oxide of Lead, Olive Oil, Water	*E. Plumbi*	*E. Resinæ* (Resin and Curd Soap) *E. Saponis* (Curd Soap and Resin)	*E. Opii* (Powdered Opium). *E. Belladonnæ* (Alcoholic Extract of Belladonna). *E. Calefaciens* (Cantharides, Expressed Oil of Nutmeg, Yellow Wax, Resin, and boiling water).
		E. Ferri (Hydrated Peroxide of Iron, Burgundy Pitch).	
		E. Galbani (Galbanum, Ammoniacum, Yellow Wax).	
		E. Hydrargyri (Mercury, Olive Oil, Sublimed Sulphur).	
		E. Plumbi Iodidi (Iodide of Lead and Resin).	

The remaining Plasters are :—

E. Ammoniaci cum Hydrargyro.	*E. Cantharidis.*	*E. Saponis Fuscum.*	*E. Picis.*
Ammoniacum Mercury Olive Oil Sublimed Sulphur	Cantharides Yellow Wax Prepared Lard Prepared Suet Resin	Hard Soap Yellow Wax Olive Oil Oxide of Lead Vinegar	Burgundy Pitch Frankincense Resin Yellow Wax Expressed Oil of Nutmeg Olive Oil Water

On reference to the above table it will be seen that *Emplastrum Plumbi* forms the basis of no less than *nine* Plasters, and that of the remaining four, *Emplastrum Saponis Fuscum* also contains a compound of olive oil and oxide of lead. *Emplastrum Ammoniaci cum Hydrargyro, Emplastrum Cantharidis*, and *Emplastrum Picis*, owe their consistence and adhesiveness to resinous substances, or to a mixture of these with wax and oleaginous matter. *Emplastrum Plumbi* is an *oleo-margarate of lead.* In its preparation the oleic and margaric acids of the oil combine with the lead, forming oleate and margarate of lead, while the glycerine, which is set free, remains dissolved in the water, or mechanically mixed with the Plaster (p. 238).

In *Emplastrum Hydrargyri* and *Emplastrum Ammoniaci cum Hydrargyro* the sublimed sulphur is employed as a means of more minutely dividing the mercury.

It would be waste of time for the student to endeavour to commit to memory the relative proportions of the constituents of every Plaster; it will suffice for him to learn what the ingredients are, and the proportion of active ingredients in the mass.

The following table shows the proportion of the active ingredient in each Plaster:—

E. Belladonnæ (Alcoholic Extract)	1 in 2
E. Picis	
E. Cantharidis	1 in 3
E. Hydrargyri	1 in $3\frac{2}{3}$
E. Ammoniaci cum Hydrargyro (Mercury)	1 in 5
E. Saponis Fuscum (Soap)	1 in $5\frac{1}{2}$
E. Saponis (Soap)	1 in 7
E. Plumbi Iodidi	1 in 8
E. Opii	1 in 10
E. Resinæ	
E. Galbani	1 in 11
E. Ferri (Peroxide)	
E. Calefaciens (Cantharides)	1 in 25

ENEMATA (INJECTIONS, CLYSTERS).

These are substances in a liquid form intended for injection up the rectum, either for the purpose of evacuating the bowel (when the quantity of liquid should be large), or for acting medicinally on the neighbouring parts or on the system (when the bulk of the vehicle should be small). There are five of them in the Pharmacopœia:—

Enema Aloes.
,, Asafœtidæ.
,, Magnesii Sulphatis.
,, Opii.
,, Terebinthinæ.

Mucilage of starch forms the basis of all the Enemata, with the exception of *Enema Asafœtidæ.* In this one *cold* water is the basis.

The following are the formulæ :—

	Active Ingredient.	Basis.	Other Ingredients.
E. Asafœtidæ	Asafœtida . . . . 30 grs.	4 ozs.	
E. Aloes	Aloes . . . . . 40 grs.	10 ozs.	Carbonate of Potassium, 15 grs.
E. Opii	Tincture of Opium . . ½ drm.	2 ozs.	
E. Magnesii Sulphatis	Sulphate of Magnesium . 1 oz.	15 ozs.	Olive Oil, 1 oz.
E. Terebinthinæ	Oil of Turpentine . . 1 oz.	15 ozs.	

ESSENTIÆ (ESSENCES).

Of these there are only two in the Pharmacopœia, viz. :—

Essentia Anisi.
„ Menthæ Piperitæ.

They are solutions of 1 part of the volatile oil to 4 parts of rectified spirit.

EXTRACTA (EXTRACTS).

These are preparations obtained by evaporating solutions of vegetable principles. They may be conveniently divided into classes according to their method of preparation.

Class I.

Fresh or Green Extracts.

Preparation.—The juice pressed out from 112 lb. of the bruised plant is heated to 130° F. *to coagulate the green colouring matter;* this is then filtered off, and the fluid is heated to 200° F. *to coagulate the albumen,* which is separated by filtration. The fluid is now evaporated, at not above 140°, to a thin syrupy consistence; the green colouring matter, which was separated in an early stage of the process, is added, and the whole evaporated down to the required consistence.

The following are the Extracts thus prepared, with the parts of the plants used :—

Extractum Aconiti (Fresh leaves and flowering tops).
„ Belladonnæ (Fresh leaves and young branches).
„ Conii (Fresh leaves and young branches).
„ Hyoscyami (Fresh leaves and young branches).
„ Lactucæ (Flowering herb).

Another group of Extracts belonging to this class are prepared by heating the juice at once to 212° F. *to coagulate the albumen*, filtering and evaporating to a proper consistence at 160°.

The Extracts thus prepared are :—

Extractum Colchici (Fresh corms without coats).
„ Colchici Aceticum (ditto).
„ Taraxaci (Fresh root).

In the preparation of *Extractum Colchici Aceticum*, 7 lb. of the fresh corms deprived of their coats are heated with 6 oz. of acetic acid before the juice is pressed out. The quantity of taraxacum root used in *Extractum Taraxaci* is 4 lb.

Class II.

Aqueous Extracts.

Prepared from drugs (1 lb. is the quantity directed in each case) by the action of distilled water, cold or boiling, and subsequent evaporation to a proper consistence.

1. Prepared by digestion in *boiling* water :—

Extractum Aloes Barbadensis.
„ Aloes Socotrinæ.
„ Pareiræ.

2. Prepared by infusion in *boiling* water and subsequent boiling :—

Extractum Gentianæ.
,, Hæmatoxyli.

3. Prepared by decoction :—

Extractum Anthemidis.

4. Prepared by maceration in *cold* water :—

Extractum Calumbæ.
,, Glycyrrhizæ.
,, Krameriæ.
,, Quassiæ.
,, Opii.

In all the foregoing Extracts, except those prepared by maceration in cold water, the quantity of water used is 1 gallon. In *Extractum Opii* the opium is macerated with 6 pints of water; in *Extractum Calumbæ* and *Extractum Glycyrrhizæ* the drug is macerated with 4 pints of water; while in *Extractum Krameriæ* and *Extractum Quassiæ* a sufficiency of water is directed. In *Extractum Anthemidis* 15 mins. of oil of chamomile are directed to be added at the end of the process of evaporation.

CLASS III.

Alcoholic Extracts.

Prepared from drugs (1 lb. is the quantity ordered in each case, except in that of *Extractum Colocynthidis Compositum*) by the action of rectified spirit, rectified spirit and water, or proof spirit, and subsequent evaporation to a proper consistence.

1. Prepared with rectified spirit :—

Extractum Cannabis Indicæ.
,, Physostigmatis.
,, Nucis Vomicæ.

In *Extractum Cannabis Indicæ* and *Extractum Physostigmatis* the drug is treated with 4 pints of cold spirit; in the former extract the process is one of maceration, and in the latter percolation is employed as well. In *Extractum Nucis Vomicæ* the drug is steamed, rapidly dried, and pulverised, and then *boiled* with successive portions of spirit until the latter comes off free from bitterness.

2. Prepared with rectified spirit and water :—

Extractum Belladonnæ Alcoholicum.
" Cascaræ Sagradæ.
" Gelsemii Alcoholicum.
" Jaborandi.
" Jalapæ.
" Rhei.
" Lupuli.
" Papaveris.
" Rhamni Frangulæ.

In the preparation of *Extractum Belladonnæ Alcoholicum, Extractum Cascaræ Sagradæ, Extractum Gelsemii Alcoholicum Extractum Jaborandi and Extractum Rhamni Frangulæ*, the respective drugs are macerated in 2 pints of spirit for 48 hours and then transferred to a percolator, the percolator being continued with 2 pints of water.

In the preparation of *Extractum Jalapæ* the drug is macerated in 4 pints of spirit and 1 gallon of water *successively*, as the action of the water is facilitated when the resin is abstracted by the spirit. In *Extractum Rhei* the drug is macerated in a mixture of 10 oz. of spirit with 5 pints of water. In *Extractum Lupuli*, after maceration in 1½ pints of spirit, the tincture is pressed out, filtered, and the spirit distilled off, leaving a soft extract. The residual hop then is directed to be *boiled* with 1 gallon of water and made into a soft extract. Finally, the two extracts are mixed and evaporated down to a suitable consistence. In the preparation of *Extractum Papaveris* also, *boiling* water is ordered.

3. Prepared with proof spirit :—

Extractum Colocynthidis Compositum.
,, Stramonii.

The student should very carefully distinguish between the *Extractum Colocynthidis Compositum* and the *Pilula Colocynthidis Compositum.* The composition of the latter will hereafter be considered; the following are the ingredients of the former :—Colocynth pulp (6 oz. macerated in 1 gallon of proof spirit), Extract of Socotrine Aloes (12 oz.), Resin of Scammony (4 oz.), Hard Soap (3 oz.), and Cardamom Seeds (1 oz). In the preparation of *Extractum Stramonii* the oil of the seeds is removed by the action of washed ether before percolation with the spirit.

Class IV.

Ethereal Extracts.

Extractum Mezerei Æthereum.

Prepared by maceration of 1 lb. of the drug in 8 pints of rectified spirit, and evaporating to form a spirit extract; the latter is then macerated in 1 pint of ether and again evaporated.

Ether is also employed in the preparation of *Extractum Stramonii*, and *Extractum Filicis Liquidum*—in the two former to free the preparation from oil, and in the latter as a solvent of the active matter.

Class V.

Liquid Extracts.

These are fluid preparations, in which the solvent is mostly water, with rectified spirit added as a preservative.

They are:—

		Strength.
Extractum	Cascaræ Sagradæ Liquidum	1 in 1.
,,	Cimicifugæ Liquidum	
,,	Cinchonæ Liquidum	
,,	Cocæ Liquidum	
,,	Ergotæ Liquidum	
,,	Belæ Liquidum	
,,	Glycyrrhizæ Liquidum	
,,	Pareiræ Liquidum	
,,	Rhamni Frangulæ Liquidum	
,,	Sarsæ Liquidum	
,,	Taraxaci Liquidum	
,,	Opii Liquidum	1 in 20 (of extract), or 1 grain in 22 minims.
,,	Filicis Liquidum.	

These Liquid Extracts may, in general terms, be said to be prepared by maceration of the drug in water, evaporating the aqueous infusion, and adding spirit to prevent decomposition. The *Extractum Cimicifugæ Liquidum* and the *Extractum Cocæ Liquidum* are prepared by maceration and percolation with pure spirit. *Extractum Opii Liquidum* is prepared by digestion of the extract of opium in water, adding the spirit, and filtering. Cold water is used in all cases except *Extractum Cascaræ Sagradæ Liquidum* (boiling water) and *Extractum Sarsæ Liquidum* (water at 160° F.). In the preparation of *Extractum Stramonii*, as has been mentioned, the seeds, before maceration, are directed to be percolated with *washed* ether, the object of which is to remove the oil present. The ether is washed to ensure its freedom from alcohol, which is a solvent of the active principle.

The so-called *Extractum Filicis Liquidum* is rather an Ethereal Extract, and is simply made by percolating 2 lb. of the drug with 4 pints of ether.

GLYCERINA (GLYCERINES).

These are :—

Glycerinum Acidi Carbolici.
,, Acidi Gallici.
,, Acidi Tannici.
,, Aluminis.

Glycerinum Amyli.
,, Boracis.
,, Plumbi Sub-acetatis.
,, Tragacanthæ.

The first three are solutions of 1 part of the drug in 4 parts of glycerine ; the *glycerine of alum* contains 1 part in 5 of glycerine ; the *glycerine of borax* 1 part of borax in 4 of glycerine and 2 of water. The *glycerine of starch* (1 part in 8 of glycerine and water) and the *glycerine of tragacanth* (3 parts in 14 of glycerine and water) are translucent jellies.

INFUSA (INFUSIONS).

These are aqueous solutions of the constituents of vegetables obtained without boiling. They are prepared by digesting the drug (which is to be cut small, sliced, bruised or powdered) in distilled water for a definite period in a covered vessel, and subsequently straining.

Infusion is preferable to decoction, when by the latter process the active principle would be volatilised (Buchu, etc.), or a chemical change induced (Senna, etc.).

The following are the official Infusions, with the proportion of the drug ordered. The proportion of water ordered is in each case 10 oz.

Infusum Digitalis, 28 grains.
,, Quassiæ, 55 grains.

,, Caryophilli	$\frac{1}{4}$ oz.
,, Chiratæ	
,, Ergotæ	
,, Rhei	
,, Rosæ Acidum	
,, Serpentariæ	
,, Valerianæ	

Infusum Lini, 150 grains.	
„ Catechu, 160 grains.	
„ Anthemidis	½ oz.
„ Aurantii	
„ Buchu	
„ Calumbæ	
„ Cinchonæ Acidum	
„ Cusso (in 8 fl. oz.)	
„ Cuspariæ	
„ Jaborandi	
„ Krameriæ	
„ Lupuli	
„ Maticæ	
„ Senegæ	
„ Uvæ Ursi	
„ Cascarillæ	1 oz.
„ Sennæ	

Of the above, all are absolutely simple, except *Infusum Rosæ Acidum*, which has 1 drachm of dilute sulphuric acid added; *Infusum Catechu*, which contains 30 grains of cinnamon bark; *Infusum Lini*, which contains 50 grains of liquorice-root; and *Infusum Sennæ*, which has 28 grains of ginger.

The *Compound Infusions* are:—

Infusum Gentianæ Compositum.	*Infusum Aurantii Compositum.*
Bitter Orange Peel, 55 grains.	Bitter Orange Peel, ¼ oz.
Fresh Lemon Peel, ¼ oz.	Fresh Lemon Peel, 56 grains.
Gentian Root, 55 grains.	Cloves, 28 grains.
Boiling Distilled Water, 10 oz.	Boiling Distilled Water, 10 oz.

In the preparation of *Infusum Lini* the seeds are not to be crushed, as the mucilage is contained in the covering. *Infusum Cusso* is directed *not to be strained.*

Boiling distilled water is used in every case, except *Infusum Chiratæ* and *Infusum Cuspariæ*, in which water at 120° F. is employed; while in *Infusum Calumbæ* and *Infusum Quassiæ*, cold water is ordered, so that the starch may not be dissolved.

The length of time of infusion varies, and is regulated by the solubility of the active ingredients. It is one hour in the majority of cases; fifteen minutes in *I. Anthemidis*, *I. Aurantii*, *I. Aurantii Compositum*, and *I. Cusso;* half-an-hour in *I. Caryophylli*, *I. Catechu*, *I. Chiratæ*, *I. Ergotæ*, *I. Jaborandi*, *I. Maticæ*, *I. Quassiæ*, and *I. Rosæ Acidum;* two hours in *I. Cinchonæ Acidum*, *I. Cuspariæ*, *I. Lupuli*, *I. Serpentariæ*, and *I. Uvæ Ursi;* and four hours in *I. Lini.*

INJECTIONES (INJECTIONS).

There are three preparations of this class in the Pharmacopœia, viz:—

Injectio Apomorphinæ Hypodermica.
„ Ergotini „
„ Morphinæ „

In the first, 2 grains of hydrochlorate of apomorphine are dissolved in 100 minims of camphor-water and filtered; but the solution of ergotine contains 1 part to 2 of camphor-water. Both these solutions should be made fresh each time they are required for use.

The solution of acetate of morphine for hypodermic administration contains 1 grain of the acetate in 10 minims of the injection. It is prepared as follows:—Dissolve hydrochlorate of morphine (92 grains) in 2 oz. of distilled water, aiding the solution by a gentle heat; then add solution of ammonia so as to precipitate the morphine and render the liquid slightly alkaline; allow it to cool; collect the precipitate on a filter, wash it with distilled water, and allow it to drain; then transfer the morphine to a small porcelain dish with about an ounce of distilled water, apply a gentle heat, and carefully add acetic acid until the morphine is dissolved and a very slightly acid solution is formed. Add now sufficient distilled water to make the solution measure exactly 2 fluid oz. Filter and preserve the product in a stoppered bottle excluded from the light.

It is a clear solution, and should be free from any solid particles (fungi). Very slightly acid to test-paper. A fluid drachm of it, rendered slightly alkaline by the addition of solution of ammonia, yields a precipitate of morphine which, after being washed and dried, should weigh 4·25 grains, corresponding to 6 grains of acetate of morphine.

LAMELLÆ.

Three preparations of this kind have been introduced into the Pharmacopœia for ophthalmic purposes.

Lamellæ Atropinæ.
,, Cocainæ.
,, Physostigminæ.

These discs are prepared with gelatine and glycerine, and their weight is directed not to exceed $\frac{1}{50}$ grain. The *Lamellæ Atropinæ* should contain $\frac{1}{5000}$ grain each; the *Lamellæ Cocainæ* $\frac{1}{200}$ grain each, and the *Lamellæ Physostigminæ* $\frac{1}{1000}$ grain each.

LINIMENTA (EMBROCATIONS).

Preparations for external use, applicable to the skin by gentle friction with the hand or by painting.

They all contain either a fixed or volatile oil or soap, camphor being regarded as a concrete volatile oil. They may be divided into groups according to their method of preparation:—

CLASS I.

Prepared by macerating and percolating 20 parts of the root with 20 parts of rectified spirit, and then adding 1 part of camphor.

Linimentum Aconiti } $1\frac{1}{2}$ in 1.
,, Belladonnæ }

CLASS II.

Those of which olive oil forms the basis.

Linimentum Calcis, 1 in 2.
,, Ammoniæ, 1 in 4.
,, Camphoræ, 1 in 5.

In *Linimentum Calcis* and *Linimentum Ammoniæ*, the officinal solution of the base is respectively employed, and this reacting with the oil forms a soap.

CLASS III.

Those of which camphor liniment forms the basis.

Linimentum Chloroformi, 1 in 2.
,, Terebinthinæ Aceticum, 1 in 3.
,, Hydrargyri, 1 (of mercury) in 6.

Linimentum Chloroformi is a simple mixture of chloroform and camphor liniment; *Linimentum Terebinthinæ Aceticum* is a mixture of 1 part each of oil of turpentine, acetic acid, and camphor liniment; while *Linimentum Hydrargyri* is made by gently heating 1 part each of ointment of mercury and camphor liniment, and then adding gradually 1 part of solution of ammonia.

CLASS IV.

Those of which soap liniment forms the basis.

Linimentum Opii, 1 (of tincture) in 2.

This is a simple mixture of equal parts of tincture of opium and soap liniment.

Class V.

Includes the liniments of more complex constitution. The following table will facilitate the recollection of the ingredients of each :—

Liniment.	Active Ingredient and Strength.	Ordinary Ingredients.			Extra Ingredients.
L. Potassii Iodidi cum Sapone	Iodide of Potassium and Hard Soap, 1 in 9	Oil of Lemon	—	—	Glycerine and Distilled Water.
L. Crotonis	Croton Oil, 1 in 8	Oil of Cajuput	Rectified Spirit	—	—
L. Saponis	Hard Soap	Oil of Rosemary	Rectified Spirit	Camphor	Distilled Water.
L. Camphoræ Compositum	Strong Solution of Ammonia, 1 in 4½	Oil of Lavender	Rectified Spirit	Camphor	—
L. Sinapis Compositum	Oil of Mustard, 1 in 40	Castor Oil	Rectified Spirit	Camphor	Ethereal Extract of Mezereon and Distilled Water.
L. Iodi	Iodine (1⅛ in 10) and Iodide of Potassium	—	Rectified Spirit	Camphor	—
L. Terebinthinæ	Oil of Turpentine, 1 in 1⅘	—	—	Camphor	Soft Soap.

LIQUORES (SOLUTIONS).

There are forty-eight formulæ for the preparation of these in the Pharmacopœia. With three exceptions (Liquor Antimonii Chloridi, Liquor Epispasticus, and Liquor Gutta-percha), they may be defined as consisting of substances, sometimes gaseous, dissolved in, or diluted with, water.

They may be conveniently divided into groups as follows :—

Class I.

Solutions of the Metalloids.

Liquor Iodi.
„ Chlori.

Liquor Iodi.—Prepared by dissolving 22 grains of iodine in 1 oz. of water by the aid of 33 grains of iodide of potassium. The solubility of iodine in water is greatly increased by the presence of the iodide.

Liquor Chlori.—This is a solution of chlorine gas in half its volume of water. It is prepared by passing the washed gas, made by the action of hydrochloric acid on black oxide of manganese ($4HCl + MnO_2 = 2Cl + 2H_2O + MnCl_2$), into water.

As this solution is liable to be decomposed by light and exposure to air, at first into *hydrochloric* and *hypochlorous acids*, and ultimately into *hydrochloric acid* and *oxygen*, it is directed to be preserved in green glass bottles well stoppered, and to be kept in a cool, dark place.

Liquor Chlori is of a yellowish-green colour, with a strong odour of chlorine; it instantly discharges the colour of a dilute solution of sulphate of indigo. Its specific gravity is 1·003. If no fixed impurities are present there will be no residue on evaporation. The Pharmacopœia directs the following quantitative test, which indicates that the proper amount of chlorine (2·66 grains to the fluid oz.) is present:—When a solution of 20 grains of iodide of potassium in an ounce of water is added to a fluid ounce (439 grains by weight) of the *Liquor Chlori*, the mixed solution acquires a deep red colour, owing to the liberation of iodine, thus:—$2KI + Cl_2 = 2KCl + I_2$. On adding to this coloured solution 750 grain-measures of the volumetric solution of hyposulphite of sodium, the colour is discharged, owing to the reaction of the free iodine on the sodium salt forming colourless iodide of sodium and tetrathionate of sodium.

Class II.

Solutions of Alkalies, or Alkaline Earths, whose neutralising power is estimated by the amount of volumetric solution of oxalic acid which they are capable of saturating.*

Liquor Ammoniæ Fortior.
,, Ammoniæ.
,, Potassæ.
,, Sodæ.
,, Calcis.
,, Calcis Saccharatus.

We will consider consecutively the method of preparation, neutralisation, strength, specific gravity, and tests for purity of the foregoing.

PREPARATION.

Liquor Ammoniæ Fortior is made by passing ammoniacal gas, made by the action of slaked lime on chloride of ammonium—

$$2NH_4Cl + Ca2HO = Ca_2Cl + 2NH_3 + 2H_2O,$$

into water contained in a Woulff's bottle, under pressure, until the requisite strength is attained.

Liquor Ammoniæ is simply made by diluting one part of the strong liquor with two parts of water.

Liquor Potassæ and *Liquor Sodæ* are solutions of their respective hydrates in water, made by the action of slaked lime on their carbonates :—

$$K_2CO_3 + Ca2HO = CaCO_3 + 2KHO.$$

In each the carbonate of lime is deposited, and the supernatant liquor is directed to be decanted or drawn off with a syphon, as filters are acted upon by it.

---

* 1,000 grain-measures of the Volumetric Solution of Oxalic (a dibasic) Acid contain half an equivalent in grains (63) of Oxalic Acid, and will therefore neutralise an equivalent in grains of an alkali or alkaline carbonate.

Liquor Calcis is very simply made by saturating water with slaked lime, and decanting or drawing off with a syphon (for the same reason as in Liquor Potassæ) the clear solution.

Liquor Calcis Saccharatus is made by digesting for some hours a mixture of 1 part of slaked lime and 2 parts of refined sugar in 20 of water.

Slaked lime is very sparingly soluble in water, requiring 732 parts of cold, and 1,500 of boiling water. Sugar greatly increases the solubility of lime, so that the saccharated solution is nearly 12½ times stronger than the simple solution, a fluid ounce of the latter containing only half a grain of lime.

Liquor Potassæ, Liquor Sodæ, Liquor Calcis, all strongly attract carbonic acid from the atmosphere, and hence they are to be kept in well-stoppered bottles. They are furthermore directed to be kept in *green* glass-bottles, in consequence of the solvent power they exert over the oxide of lead contained in white glass.

NEUTRALISATION.*

	Grains Weight.		Grain-measures of Vol. Sol.
Liquor Ammoniæ Fortior	52·3	=	1000
„ Ammoniæ	85	=	500
„ Potassæ	462·9	=	482
„ Sodæ	458·0	=	470
„ Calcis	4375·0	=	180
„ Calcis Saccharatus	460·2	=	254

STRENGTH.

Liquor Ammoniæ Fortior.—32·5 (of NH_3) per cent. One fluid drachm contains 15·83 grains.

Liquor Ammoniæ.—10 (of NH_3) per cent. One fluid drachm contains 5·2 grains.

---

* Vide footnote, preceding page.

Liquor Potassæ.—5·84 (of KHO) per cent. One fluid oz. contains 27 grains.

Liquor Sodæ.—4·1 (of NaHO) per cent. One fluid oz. contains 18·8 grains.

Liquor Calcis.—One fluid oz. contains half a grain of CaO.

Liquor Calcis Saccharatus.—One fluid oz. contains 7·11 grains of CaO.

SPECIFIC GRAVITY.

Liquor Ammoniæ Fortior - - -	0·891
„ Ammoniæ - - - -	0·959
„ Potassæ - - - -	1·058
„ Sodæ - - - -	1·047
„ Calcis Saccharatus - - -	1·052

TESTS FOR PURITY.

Liquor Ammoniæ Fortior:—

1. When diluted with four times its volume of water it gives no precipitate with—

(*a*) Solution of lime = absence of carbonate;
(*b*) Oxalate of ammonium = absence of lime;
(*c*) Sulphide of ammonium = absence of oxide of copper;
(*d*) Ammonio-sulphate of copper = absence of sulphide of ammonium.

2. When treated with excess of nitric acid it is not rendered turbid by—

(*a*) Nitrate of silver = absence of chlorides;
(*b*) Chloride of barium = absence of sulphates.

When "pyrrol" exists as an impurity of the commercial liquor, it may be detected by affording a red colour with nitric or sulphuric acid.

Liquor Potassæ and *Liquor Sodæ.*—The following tests are directed for both of these solutions:—

1. No effervescence with diluted hydrochloric acid = absence of carbonate.

2. Mixed with an equal volume of distilled water there is no precipitate with—

(*a*) Solution of lime = absence of carbonate;
(*b*) Oxalate of ammonium = absence of lime.

3. Treated with excess of diluted nitric acid and evaporated to dryness, the residue forms with water a nearly clear solution, which may be slightly precipitated by—

(*a*) Chloride of barium = trace of sulphates;
(*b*) Nitrate of silver = trace of chlorides;

but is merely rendered turbid (or unaffected in the soda solution) by—

Ammonia = trace of alumina.

Liquor Ammoniæ Fortior is employed in the preparation of Ammonii Phosphas, Linimentum Camphoræ Compositum, Liquor Ammoniæ, Liquor Ammonii Citratus, Spiritus Ammoniæ Aromaticus, and Tinctura Opii Ammoniata.

Liquor Ammoniæ is used in Linimentum Ammoniæ and Tinct. Quininæ Ammoniata.

Liquor Calcis enters into the formation of Linimentum Calcis, Lotio Hydrargyri Flava, Lotio Hydrargyri Nigra, and is used in making Argenti Oxidum.

CLASS III.

Effervescing Solutions of Alkalies.

Liquor Lithiæ Effervescens.
,, Potassæ Effervescens.
,, Sodæ Effervescens.

These are made by passing as much carbonic acid gas (generated by the action of sulphuric acid on chalk) as possible, under a pressure of seven atmospheres, into a solution of 30 grains of the bicarbonate (or in the case of Lithia, 10 grains of the carbonate) in 1 pint of water. The solutions must be kept in bottles securely closed. They all effervesce strongly when the containing vessel is opened, owing to the escape of carbonic acid gas.

The following are the tests directed :—

Liquor Lithiæ Effervescens.—Ten fluid oz. evaporated to dryness yield 5 grains of a solid white residue, which answers to the tests for carbonate of lithium (p. 90).

Liquor Sodæ Effervescens.—Ten fluid oz. boiled for five minutes require for neutralisation 178 grain-measures of the volumetric solution of oxalic acid.

Liquor Potassæ Effervescens.—Ten fluid oz. boiled for five minutes require for neutralisation 150 grain-measures of the volumetric solution of oxalic acid.

Five fluid oz. evaporated to one-fifth, and 12 grains of tartaric acid added, yield a crystalline precipitate (of acid tartrate of potassium) which, when dried, weighs not less than 12 grains.

CLASS IV.

Chlorinated Solutions.

Liquor Calcis Chlorinatæ.
„ Sodæ Chlorinatæ.

Liquor Calcis Chlorinatæ is prepared by digesting 1 lb. of chlorinated lime in 1 gallon of water. Hypochlorite of calcium, chloride of calcium, and a little caustic lime are dissolved ; but any carbonate of calcium which may be present, and excess of caustic lime, are thrown down and are to be separated by a calico filter.

Liquor Sodæ Chlorinatæ is a mixed solution of hypochlorite of sodium, chloride of sodium, and bicarbonate of sodium, and is known as "Labarraque's Disinfecting Fluid." It is made by mixing 24 oz. of carbonate of sodium, dissolved in 2 pints of water, with 16 oz. of chlorinated lime triturated with 6 pints of water, the product to be filtered. By the action of chlorinated lime on the solution of the carbonate of sodium, chlorinated soda and carbonate of calcium are formed, thus :—

$$CaCl_2O_2,CaCl_2 + 2(Na_2CO_3) = (NaClO,NaCl)_2 + 2CaCO_3.$$

The following are the tests directed, the explanations of which are given under *Liquor Chlori* (p. 340) :—

Liquor Calcis Chlorinatæ.—Eighty grains by weight added to a solution of 20 grains of iodide of potassium in 4 oz. of water, and acidulated with 2 drachms of hydrochloric acid, give a red solution, which requires for the discharge of its colour not less than 450 grain-measures of the volumetric solution of hyposulphite of sodium, corresponding to 2 per cent. of available chlorine. Very good specimens may yield as much as 3 per cent. of available chlorine.

Liquor Sodæ Chlorinatæ.—One fluid drachm (70 grains by weight) added to a solution of 20 grains of iodide of potassium in 4 oz. of water, and acidulated with 2 drachms of hydrochloric acid, gives a brown solution, which requires for the discharge of its colour 500 grain-measures of the volumetric solution of hyposulphite of sodium. By the mutual reaction of Liquor Sodæ Chloratæ and iodide of potassium in an acid solution, iodine is liberated ; thus :—

$$NaClO + NaCl + 2KI + 2HCl = 2NaCl + 2KCl + H_2O + 2I.$$

Liquor Sodæ Chlorinatæ has an alkaline reaction, due to the reaction of the bicarbonate ; it derives its property of bleaching vegetable colours from the chlorine. On adding hydrochloric acid to it effervescence ensues, owing to the evolution of carbonic acid gas and chlorine, and a solution is formed which gives no precipitate with perchloride of platinum, indicating the absence of potash. It should give no precipitate with oxalate of ammonium, indicating the absence of lime.

Liquor Sodæ Chlorinatæ is contained in Cataplasma Sodæ Chlorinatæ.

CLASS V.

Solutions of the other Metallic Salts, etc.

Liquor Acidi Chromici.
,, Ammonii Acetatis.
,, Ammonii Acetatis Fortior.
,, Ammonii Citratis.
,, Ammonii Citratis Fortior.
,, Antimonii Chloridi.
,, Arsenicalis.
,, Arsenici Hydrochloricus.
,, Arsenii et Hydrargyri Iodidi.
,, Bismuthi et Ammonii Citratis.
,, Calcii Chloridi.
,, Ferri Acetatis.
,, Ferri Acetatis Fortior.
,, Ferri Dialysatus.
,, Ferri Perchloridi.
,, Ferri Perchloridi Fortior.
,, Ferri Pernitratis.
,, Ferri Persulphatis.
,, Hydrargyri Nitratis Acidus.
,, Hydrargyri Perchloridi.
,, Magnesii Carbonatis.
,, Magnesii Citratis.
,, Plumbi Subacetatis.
,, Plumbi Subacetatis Dilutus.
,, Potassii Permanganatis.
,, Sodii Arseniatis.
,, Sodii Ethylatis.
,, Zinci Chloridi.

We will study consecutively the mode and *rationale* of preparation, the strength, specific gravity, character and tests of the foregoing.

PREPARATION.

Liquor Acidi Chromici.—This is prepared by dissolving 1 part of Chromic Acid in 3 of water.

Liquor Ammonii Acetatis Fortior.—This is made by adding 15½ oz. of crushed carbonate of ammonium to 50 oz. of acetic acid or *vice versâ*, until a neutral fluid results, and then adding distilled water to make the quantity up to 3 pints. One part of this solution mixed with four of distilled water forms the *Liquor Ammonii Acetatis.*

Liquor Ammonii Citratis Fortior.—Take 12 oz. of citric acid and neutralise by the addition of 11 fluid oz. or a sufficiency of the strong solution of ammonia. Then add sufficient distilled water to make 24 fluid oz. One part of this solution mixed with 3 parts of distilled water forms the Liquor Ammonii Citratis.

Liquor Antimonii Chloridi.—This is a solution of terchloride of antimony ($SbCl_3$) in hydrochloric acid. It is prepared by dissolving 1 lb. of black antimony (Sb_2S_3) by the aid of heat in 4 pints of hydrochloric acid, and boiling down to the bulk of 2 pints.

$$Sb_2S_3 + 6HCl = 2SbCl_3 + 3H_2S.$$

During the reaction the materials are directed to be placed beneath a flue with a good draught, in order to carry off the sulphuretted hydrogen gas.

Liquor Arsenicalis.—Commonly known as "Fowler's Solution." It is made by dissolving, by the aid of heat, 87 grains each of arsenious acid and carbonate of potassium in 10 oz. of water; when cool, adding 5 drachms of compound tincture of lavender, and finally adding distilled water to make up the bulk to 1 pint. The solution of arsenious acid in water is facilitated by the presence of the alkaline carbonate, which is slowly decomposed by it. The officinal solution therefore contains a small quantity of arsenite of potassium:—

$$K_2CO_3 + As_2O_3 = 2KAsO_2 + CO_2.$$

The compound tincture of lavender is merely added as a colouring and flavouring agent in order to prevent mistakes.

Liquor Arsenici Hydrochloricus.—Made by boiling 87 grains of arsenious acid with 2 drachms of hydrochloric acid and 4 oz. of water until it is dissolved, and then adding water to make up the bulk to 1 pint. It is not a chemical compound, but a solution of the arsenious acid in dilute hydrochloric acid.

Liquor Arsenii et Hydrargyri Iodidi.—This preparation, which has long been known as "Donovan's Solution," is prepared by triturating 45 grains each of iodide of arsenic and red iodide of mercury in $1\frac{1}{2}$ oz. of water until nearly all is dissolved. The product is filtered, and the filter is washed with sufficient water to yield 10 fluid oz.

Liquor Bismuthi et Ammonii Citratis.—Rub 800 grains of citrate of bismuth to a paste with a little water, add solution of ammonia gradually and with constant stirring, until the salt is just dissolved; then add enough distilled water to make 1 pint.

Liquor Calcii Chloridi.—Dissolve 88 grains of chloride of calcium in 1 fluid oz. of water, and filter if necessary.

Liquor Ferri Acetatis Fortior.—Mix 8 fluid oz. of solution of Ammonia with 1 pint of water; to this add 5 fluid oz. of solution of persulphate of iron previously diluted with 1 pint of water. Stir thoroughly, taking care that the ammonia is in slight excess. Let the mixture stand for two hours, stirring occasionally; then pass through a calico filter, and wash the precipitate with distilled water until the liquid which passes through no longer gives a precipitate with chloride of barium (absence of sulphuric acid). Squeeze out superfluous moisture, and dissolve the precipitate in 3 fluid oz. of glacial acetic acid, adding sufficient water to make 10 fluid oz. Decant the clear solution. One part of this solution mixed with 3 parts of water forms the *Liquor Ferri Acetatis.*

Liquor Ferri Dialysatus.—Mix 6 oz. of the strong solution of perchloride of iron with 2 pints of water, and stir into it sufficient solution of ammonia to impart a distinct ammoniacal odour. Filter through calico, wash the precipitate, and squeeze out superfluous moisture. Add the precipitate to 1 fluid oz. of the strong solution of perchloride of iron, stir and warm gently, and, when solution is effected, place the liquid in a covered dialyser;* then subject it to a stream of water in the usual way until the solution in the dialyser is almost tasteless. The resulting solution should measure 28 fluid oz.

Liquor Ferri Perchloridi Fortior.—An aqueous solution of perchloride of iron (Fe_2Cl_6). Dissolve 4 oz. of iron wire in a mixture of 12½ oz. of hydrochloric acid and 7 oz. of water by the aid of a gentle heat. Filter, add 7 oz. of hydrochloric acid; mix, and pour the solution slowly into 1½ oz. of nitric acid, and heat until red fumes are evolved, and the liquid turns orange-brown. Evaporate the product until no more nitrous fumes escape, and a precipitate begins to form. Then add 1 oz. of hydrochloric acid and sufficient water to produce 17½ fluid oz. of the solution.

One part of this preparation diluted with 3 parts of water forms the *Liquor Ferri Perchloridi.*

Liquor Ferri Pernitratis.—An aqueous solution of pernitrate of iron (Fe_26NO_3). Dissolve 1 oz. of iron wire in a mixture of 4½ oz. of nitric acid and 16 oz. of water, moderating the action, if necessary, by adding more water. Filter, and add water to 1½ pints. In the reaction which ensues, pernitrate of iron is formed, water is produced, and nitric oxide evolved.

$$2Fe + 8HNO_3 = Fe_26NO_3 + 4H_2O + 2NO.$$

---

* Dialysis consists in the separation of substances by diffusion through an animal membrane. The liquid to be dialysed is placed in a receptacle furnished with a membranous bottom and floating in water. The iron is not, strictly speaking, dialysed, since the portion left in the dialyser is the part used.

Liquor Ferri Persulphatis.—An aqueous solution of persulphate of iron (Fe_23SO_4). Dissolve 8 oz. of sulphate of iron in a mixture of 6 drachms of sulphuric acid and 10 oz. of water by the aid of heat. Add 6 drachms of nitric acid diluted with 2 oz. of water. Concentrate by boiling until the mixture changes from black to red. As long as the solution gives a blue precipitate with red prussiate of potash, add a few drops of nitric acid, and renew the boiling in order to convert all the sulphate into persulphate. When cold, add water up to 11 oz.

When nitric acid is added to a solution of sulphate of iron in sulphuric acid, the proto- is converted into the per-salt, and nitric oxide is developed.

$$6(FeSO_4) + 3(H_2SO_4) + 2(HNO_3) = 3(Fe_23SO_4) + 4H_2O + 2NO.$$

The nitric oxide is not at once evolved, but is absorbed by, and blackens, any protosulphate which may be present. This black compound is afterwards decomposed.

Liquor Hydrargyri Nitratis Acidus.—A solution of pernitrate of mercury ($Hg2NO_3$). Dissolve 4 oz. of mercury in a mixture of 5 oz. of nitric acid and $1\frac{1}{2}$ oz. of water without heat. Then boil gently for 15 minutes, to ensure the formation of the pernitrate, and to cause the expulsion of the nitric oxide.

The reaction is thus expressed :—

$$3Hg + 8HNO_3 = 3(Hg2NO_3) + 4H_2O + 2NO.$$

Liquor Hydrargyri Perchloridi.—An aqueous solution of the perchloride of mercury ($HgCl_2$). Dissolve 10 grains each of perchloride of mercury and chloride of ammonium in 1 pint of water.

The chloride of ammonium is to increase the solvent power of the water.

Liquor Magnesii Carbonatis.—To a solution of 2 oz. of sulplate of magnesium in $\frac{1}{2}$ pint of water heated to boiling-point, add a solution of 2½ oz. of carbonate of sodium in ½ pint of water. Boil until carbonic acid is no longer evolved. Collect the precipitated carbonate of magnesium on a filter, and wash until the washings give no precipitate with chloride of barium (absence of a sulphate). Mix the washed precipitate with 1 pint of water, and saturate it with washed carbonic acid gas passed in under slight pressure. Filter the liquid after 24 hours to remove any undissolved carbonate of magnesium, and again pass carbonic acid gas into the filtered solution. Preserve in a well-stoppered bottle.

Liquor Magnesii Citratis.—Dissolve 200 grains of citric acid in 2 oz. of water, and having added 100 grains of carbonate of magnesium, stir until it is dissolved. Filter the solution into a strong half-pint bottle, add ½ oz. of syrup of lemons and sufficient water to nearly fill the bottle, then introduce 40 grains of bicarbonate of potassium, and immediately close the bottle with a cork, which should be secured with string or wire. Afterwards shake the bottle until the bicarbonate of potassium has dissolved.

The addition of the bicarbonate of potassium is to generate carbonic anhydride so as to render the solution effervescing. Citrate of potassium is thus also formed in the solution.

Liquor Plumbi Subacetatis, commonly known as "Goulard's Extract." Boil 5 oz. of acetate of lead and 3½ oz. of oxide of lead in 1 pint of distilled water for half an hour. Filter, and when cold add water up to 20 oz. Keep in stoppered bottles. The acetate of lead combines with the oxide of lead to form a mixture of oxyacetates, which is collectively known as the subacetate, thus :—

$$PbO + Pb2C_2H_3O_2 = Pb_2O2C_2H_3O_2.$$

Liquor Plumbi Subacetatis Dilutus, commonly known as "Goulard Water." Mix 2 drachms each of solution of subacetate of lead and rectified spirit with 19½ oz. of distilled water ; filter, and keep in a stoppered bottle.

If this preparation be not made with distilled water it becomes milky from the formation of other salts of lead, as the carbonate and sulphate.

Liquor Potassii Permanganatis.—Similar to, but half the strength of, "Condy's Disinfecting Fluid." Made by dissolving 88 grains of permanganate of potassium ($KMnO_4$) in 1 pint of distilled water.

Liquor Sodii Arseniatis.—Dissolve 9 grains of arseniate of sodium (rendered anhydrous by a heat not exceeding 300°) in 2 oz. of water.

Liquor Sodii Ethylatis.—Dissolve 22 grains of metallic sodium in 1 oz. of ethylic alcohol contained in a flask, the latter being kept cool in a stream of cold water. It does not keep well, and should therefore be freshly prepared.

Liquor Zinci Chloridi.—Represents "Sir W. Burnett's Disinfecting Fluid." Dissolve 1 lb. of zinc in a mixture of 44 oz. of hydrochloric acid and 1 pint of water, by the aid of gentle heat, until gas is no longer evolved. Boil for half an hour; add water to supply the loss by evaporation; cool; filter. Add solution of chlorine gradually, with frequent agitation, until a permanent odour of chlorine is acquired by the liquid. Add $\frac{1}{2}$ oz. of carbonate of zinc gradually until a brown sediment appears. Filter, and evaporate down to 2 pints.

The following is the reaction :—

$$Zn + 2HCl = ZnCl_2 + 2H.$$

The object of the chlorine is to free the zinc from iron by converting the latter into perchloride, thus :—

$$2Cl + 2FeCl_2 = Fe_2Cl_6.$$

This perchloride is then, by the action of carbonate of zinc, converted into the brown peroxide, and is precipitated as such, thus :—

$$Fe_2Cl_6 + 3ZnCO_3 + 3H_2O = Fe_26HO + 3ZnCl_2 + 3CO_2.$$

STRENGTH.

Liquor Arsenicalis	1 in 100 (by weight) or 1 grain in 110 minims
,, Arsenici Hydrochloricus	
,, Arsenii et Hydrargyri Iodidi	
,, Sodii Arseniatis	
,, Potassii Permanganatis	
,, Ferri Perchloridi Fortior	1 in 1
,, Ferri Perchloridi	1 in 4
,, Ferri Acetatis Fortior	1 in 1
,, Ferri Acetatis	1 in 4
,, Ferri Pernitratis	1 in 6
,, Acidi Chromici	1 in 3½
,, Calcii Chloridi	1 in 5
,, Magnesii Carbonatis	1 in 37
,, Plumbi Subacetatis Dilutus	1 in 80
,, Hydrargyri Perchloridi	1 in 960

Liquor Magnesii Carbonatis contains 10 grains of carbonate in the fluid oz. One fluid oz. of *Liquor Bismuthi et Ammonii Citratis* contains 24 grains of oxide of bismuth; 1 fluid oz. of *Liquor Zinci Chloridi* contains 366 grains of chloride of zinc.

Liquor Sodii Ethylatis contains 91·2 grains of the salt to the fluid oz.

SPECIFIC GRAVITY.

Liquor Ammonii Acetatis Fortior	1·073
,, Ammonii Acetatis	1·022
,, Ammonii Citratis Fortior	1·209
,, Ammonii Citratis	1·062
,, Antimonii Chloridi	1·47
,, Arsenicalis	1·010
,, Arsenici Hydrochlorici	1·010
,, Arsenii et Hydrargyri Iodidi	1·016

Liquor	Bismuthi et Ammonii Citratis	1·07
,,	Ferri Acetatis Fortior	1.127
,,	Ferri Acetatis	1.031
,,	Ferri Dialysatus	1.047
,,	Ferri Perchloridi Fortior	1.42
,,	Ferri Perchloridi	1·11
,,	Ferri Pernitratis	1·107
,,	Ferri Persulphatis	1·441
,,	Hydrargyri Nitratis Acidus	2·0 (about)
,,	Plumbi Subacetatis	1·275
,,	Sodii Ethylatis	·867
,,	Zinci Chloridi	1·460

TESTS, ETC.

Liquor Antimonii Chloridi.—A yellowish-red liquid. A little of it dropped into water gives a white precipitate (of oxychloride of antimony, or "Algarothi's Powder," which is a variable mixture of terchloride and teroxide); the solution filtered from this precipitate gives with nitrate of silver a copious precipitate (of chloride of silver). If the white precipitate of oxychloride be treated with sulphuretted hydrogen, it becomes orange-red (by formation of the tersulphide).

One fluid drachm mixed with a solution of $\frac{1}{4}$ oz. of tartaric acid in 4 oz. of water gives a clear solution, which, when treated with sulphuretted hydrogen, yields an orange precipitate (Sb_2S_3), weighing, when washed and dried at 212°, 22 grains.

Liquor Arsenicalis.—A reddish alkaline liquid. After acidulation with hydrochloric acid, it gives with sulphuretted hydrogen a yellow precipitate (tersulphide). One fluid oz. (442 grains by weight), boiled for five minutes with 10 grains of bicarbonate of sodium and, when cold, diluted with 6 oz. of water containing a little mucilage of starch, does not give with the volumetric solution of iodine a permanent blue colour, until 875 grain-measures have been added, corresponding to 4⅓ grains of arsenious acid. In this test, the oxygen of the soda converts the arsenious acid into arsenic acid, and the iodine combines with the sodium to form iodide of sodium. Until all the arsenious acid is converted into arsenic acid, sodium will be free for combination with iodine, which cannot therefore give the characteristic colour with starch.

Liquor Arsenici Hydrochloricus.—A colourless liquid with an acid reaction. The same quantitative test is directed for this solution as for Liquor Arsenicalis, using, however, 20 grains of bicarbonate of sodium.

Liquor Arsenii et Hydrargyri Iodidi.—A clear pale yellow liquid with a metallic flavour, sulphuretted hydrogen throws down a precipitate partially insoluble in strong nitric acid; while the dissolved part, when diluted, yields a yellow precipitate on the gradual addition of solution of sulphydrate of ammonium. One fluid oz. contains about one hundredth of a molecular weight in grains (about 1 per cent. by weight) of arsenious iodide (AsI_3 and of mercuric iodide (HgI_3).

Liquor Bismuthi et Ammonii Citratis.—Mixes with water without decomposition. Heated with solution of potash, it evolves ammonia and yields a white precipitate. On the addition of hydrochloric acid, it gives a white precipitate (oxide of bismuth), which is soluble in excess.

Two fluid drachms mixed with an oz. of water and treated with excess of sulphuretted hydrogen, give a black precipitate (sulphide of bismuth), which, washed and dried, weighs 7 grains.

Liquor Ferri Acetatis Fortior.—A deep red fluid with a sour styptic taste, miscible with water or rectified spirit in all proportions. Diluted with water it yields a blue precipitate with ferrocyanide, but not with ferricyanide of potassium.

A fluid drachm diluted with 2 oz. of water gives, with excess of ammonia, a reddish-brown precipitate, which when washed and ignited weighs 5·7 grains.

Liquor Ferri Dialysatus.—A clear dark reddish-brown liquid neutral to test-papers. The solution gives no precipitate with ferrocyanide of potassium, except after heating with hydrochloric acid, when it gives a blue precipitate. One hundred grains by weight afford a precipitate with a solution of ammonia which, washed, dried and ignited, weighs 5 grains.

Liquor Ferri Perchloridi Fortior.—An orange-brown liquid with a strong styptic taste. Diluted with water it gives a white precipitate with nitrate of silver (chloride of silver), and a dark-blue precipitate with ferrocyanide of potassium (characteristic of a persalt of iron), but no precipitate with ferricyanide of potassium (showing the absence of a protosalt of iron).

One fluid drachm mixed with 2 oz. of water gives, on adding excess of solution of ammonia, a reddish-brown precipitate (of peroxide of iron), which, washed and incinerated, weighs 15·62 grains.

A piece of copper, boiled for a few minutes in 50 or 100 grains of this solution diluted with water, and washed, dried, and heated in a dry test-tube, yields no white crystalline sublimate (absence of arsenic and antimony).

Liquor Ferri Pernitratis.—A reddish-brown liquid, with a slightly astringent taste. It gives a blue precipitate with ferrocyanide of potassium (presence of a persalt), but no precipitate with ferricyanide of potassium (absence of protosalt). When to a little of it placed in a test-tube, half its volume of pure sulphuric acid is added, and then solution of sulphate of iron is poured on, the whole assumes a dark-brown colour. This colour is due to the absorption by the solution of the sulphate of iron of nitric oxide gas, which is produced by the decomposition of the nitric acid set free by the action of the sulphuric acid.

One fluid drachm treated with excess of solution of ammonia gives a precipitate (of peroxide) which, washed, dried, and incinerated, weighs 2·6 grains.

Liquor Ferri Persulphatis.—A dark-red liquid with a very astringent taste. Diluted with 10 volumes of water it gives a white precipitate with chloride of barium (presence of a sulphate), a blue precipitate with ferrocyanide of potassium (presence of a persalt), but no precipitate with ferricyanide of potassium (absence of a protosalt).

One fluid drachm diluted with 2 oz. of water and treated with excess of solution of ammonia gives a precipitate (of peroxide), which, washed and incinerated, weighs 11·44 grains.

Liquor Hydrargyri Nitratis Acidus.—Gives a yellow precipitate with excess of solution of potash (indicating mercuric oxide, HgO). If a crystal of sulphate of iron be dropped into it, in a little time the salt of iron and the liquid in its vicinity acquire a dark colour (due to the conversion of a portion of the sulphate of iron into a state of persulphate by nitric acid, and the absorption of the nitric oxide so produced by the remaining portion of the sulphate). It gives no precipitate when a little of it is dropped into hydrochloric acid diluted with twice its volume of water (showing the absence of subnitrate, for if that were present subchloride of mercury would be formed, and this, being insoluble, would be precipitated).

Liquor Magnesii Carbonatis.—One fluid oz. evaporated to dryness yields a white solid residue, which, when calcined, weighs about 4 grains, is insoluble in water, and answers to the tests for magnesia.

Liquor Magnesii Citratis.—The formula for the preparation of this liquor is an imitation of that in the French Codex for "purgative lemonade."

Liquor Plumbi Subacetatis.—A colourless liquid with an alkaline reaction and a sweet astringent taste. It becomes turbid on exposure (by absorption of carbonic acid and consequent formation of carbonate of lead). It forms with mucilage of gum arabic an opaque white jelly. Gives with exces- of sulphuric acid a white precipitate (sulphate of lead), acetic acid being set free.

284·5 grains by weight require for perfect precipitation 500 grain-measures of the volumetric solution of oxalic acid, corresponding to 24 per cent. of the subacetate.

Liquor Potassii Permanganatis.—A dark-purple fluid, with a sweet astringent taste; mixed with a little rectified spirit and heated, it becomes yellowish-brown. One fluid oz. requires for complete decoloration a solution of 39·6 grains of granulated sulphate of iron acidulated with about 2 fluid drachms of diluted sulphuric acid.

Liquor Sodii Arseniatis.—Dissolve 9 grains of arseniate of sodium, dried at a temperature not exceeding 300° F., in 2 fluid oz. of distilled water.

Liquor Sodii Ethylatis.—A colourless liquid of syrupy consistence, becoming brown by keeping. When heated it gives off alcoholic vapours, leaving a white salt, which, on being strongly heated, chars. If the white salt be mixed with water and heated it yields alcohol, and the solution on evaporation leaves a white residue consisting almost wholly of caustic soda. It contains 19 per cent. of the solid salt.

Of the foregoing liquors: *Liquor Ferri Perchloridi Fortior* enters into the composition of Liquor Ferri Perchloridi, Tinctura Ferri Perchloridi, and Liquor Ferri Dialysatus; *Liquor Ferri Acetatis Fortior* enters into the composition of Liquor Ferri Acetatis and Tinctura Ferri Acetatis; *Liquor Ferri Persulphatis* is used in the preparation of Ferri et Ammonii Citras, Ferri et Quininæ Citras, Ferri Peroxidum Hydratum, and Ferrum Tartaratum; *Liquor Plumbi Subacetatis* is contained in Liquor Plumbi Subacetatis Dilutus.

Class VI.

Solutions of Alkaloids and their Salts.

Liquor Atropinæ Sulphatis.
,, Morphinæ Acetatis.
,, Morphinæ Bimeconatis.
,, Morphinæ Hydrochloratis.
,, Strychninæ Hydrochloratis.

Liquor Atropinæ Sulphatis.—Dissolve 9 grains of sulphate of atropinæ in 16½ fluid drachms of camphor-water.

Liquor Morphinæ Acetatis.—Dissolve 9 grains of acetate of morphine in a mixture of 18 minims of dilute acetic acid, 4 drachms of rectified spirit, and 12 drachms of water.

Liquor Morphinæ Bimeconatis.—Dissolve hydrochlorate of morphine (9 grains) in 2 or 3 drachms of water aided by warmth; precipitate morphine by ammonia, filter, and wash precipitate until the washings give no precipitate with nitrate of silver; drain, mix the precipitate with enough water to make 1½ oz.; add rectified spirit ½ oz., and meconic acid 6 grains; dissolve.

Liquor Morphinæ Hydrochloratis.—Dissolve 9 grains of hydrochlorate of morphine in a mixture of 18 minims of dilute hydrochloric acid, 4 drachms of rectified spirit, and 12 drachms of water.

Liquor Strychninæ Hydrochloratis.—Dissolve 9 grains of strychnine in a mixture of 14 minims of dilute hydrochloric acid, and 4 drachms of water by the aid of heat, and then add 4 drachms of rectified spirit and 1 oz. of water.

It will be seen that all the solutions in this group have the same strength—viz., 1 in 100, or 4⅓ grains in the fluid ounce.

The use of the rectified spirit in the last three liquors is to prevent decomposition—that of the acid is to aid solution.

The only solutions of which we have not yet spoken, and which are not referable to any of the foregoing groups, are :—

Liquor Epispasticus.
,, Gutta-percha.

Liquor Epispasticus, or "Blistering Liquid," or, as it was formerly named, Linimentum Cantharides, is prepared by macerating 5 oz. of cantharides in 3 oz. of acetic ether for 24 hours, and then percolating the mixture with acetic ether until 20 oz. are obtained.

Liquor Gutta-percha is a solution of gutta-percha in chloroform. It is thus prepared :—Add 1 oz. of gutta-percha in thin slices to 6 oz. of chloroform in a stoppered bottle, and shake them together frequently until solution has been effected. Then add 1 oz. of carbonate of lead previously mixed with 2 oz. of chloroform, and having several times shaken the whole together, set the mixture aside, and let it remain at rest until the insoluble matter has subsided. Then decant the clear liquid and keep it in a well-stoppered bottle. The carbonate of lead acts mechanically, uniting with the colouring matter. This preparation is introduced as a vehicle for the powder of black mustard-seed in making Charta Sinapis (p. 317).

LOTIONES (LOTIONS).

Of these there are but two, viz. :—

Lotio Hydrargyri Flava.
,, Hydrargyri Nigra.

They are prepared by mixing 18 grains of perchloride of mercury and 30 grains of subchloride of mercury, respectively, with 10 oz. of solution of lime.

In the preparation of *Lotio Flava*, yellow or mercuric oxide (HgO) is precipitated; thus—

$$HgCl_2 + Ca2HO = HgO + CaCl_2 + H_2O\,;$$

while in *Lotio Nigra*, black or mercurous oxide (Hg_2O) is thrown down—

$$2HgCl + Ca2HO = Hg_2O + CaCl_2 + H_2O.$$

These lotions are commonly known as "yellow wash" and "black wash."

MELLITA (HONEYS).

Including the oxymels there are four formulæ for the preparation of honeys, viz. :—

Mel Depuratum.
„ Boracis.
Oxymel.
„ Scillæ.

Mel Depuratum, clarified honey, is made by melting honey in a water-bath, and straining it while hot through flannel moistened with warm water. The honey is thus rendered less liable to ferment by the removal of the flocculent matters and other impurities.

Mel Boracis is a mixture of 60 grains of powdered borax in 1 oz. of clarified honey and 30 grains of glycerine.

Oxymel is prepared by mixing 40 oz. of melted clarified honey with 5 oz. each of acetic acid and water.

Oxymel Scillæ is made by evaporating in a water-bath, until the specific gravity of 1·32 is attained, a mixture of 1 pint of vinegar of squill and 2 lb. of clarified honey.

Mel Depuratum, besides forming an ingredient of the foregoing honeys, enters also into the composition of Confectio Piperis, Confectio Scammonii, and Confectio Terebinthinæ.

MISTURÆ (MIXTURES).

The majority of these are preparations containing substances suspended in aqueous fluids by means of sugar, gum arabic, yolk of egg, etc. When the suspended substances are oleaginous, an "emulsion" is formed.

The following are the mixtures of the Pharmacopœia :—

Mistura Ammoniaci.
,, Amygdalæ.
,, Creasoti.
,, Cretæ.
,, Ferri Aromatica.
,, Ferri Composita.
,, Guaiaci.
,, Scammonii.
,, Sennæ Composita.
,, Spiritus Vini Gallici.

Mistura Ammoniaci.—Triturate $\frac{1}{4}$ oz. of ammoniacum with 8 oz. of water gradually added, and strain through muslin. The water dissolves the gum of the gum resin, and thus the resin becomes suspended, forming an emulsion of a milky appearance.

Mistura Amygdalæ.—Triturate $2\frac{1}{2}$ oz. of compound powder of Almonds with 1 pint of water, and strain through muslin. The oleaginous matter of the almonds is suspended in the water by their albumen and by the gum and sugar which are contained in the compound powder, and thus a milk-like emulsion is formed.

Mistura Scammonii.—Triturate 6 grains of scammony in powder with 2 fluid oz. of milk gradually added. This is an imitation of "Planche's Purgative Potion."

Mistura Guaiaci.—Triturate $\frac{1}{2}$ oz. of guaiacum resin with $\frac{1}{2}$ oz. of refined sugar and $\frac{1}{4}$ oz. of gum acacia ; add gradually 1 pint of cinnamon water. An emulsion is formed by the suspension of the resin by means of the sugar and gum.

Mistura Cretæ.—Triturate $\frac{1}{4}$ oz. each of prepared chalk and powdered gum acacia with $7\frac{1}{2}$ oz. of cinnamon water, and add $\frac{1}{2}$ oz. of syrup.

Mistura Spiritus Vini Gallici.—Rub the yolk of two eggs with ½ oz. of refined sugar, and add 4 oz. each of spirit of French wine (brandy) and cinnamon water.

Mistura Creasoti.—Mix 15 minims each of creasote and glacial acetic acid; add 15 oz. of water, and then 1 oz. of syrup and ½ drachm of spirit of juniper. The acetic acid is employed to promote the solubility of the creasote, and the spirit of juniper is to mask the taste. One oz. contains 1 minim of creasote.

Mistura Sennæ Composita.—Dissolve, with the aid of gentle heat, 4 oz. of sulphate of magnesia and 1 oz. of extract of liquorice in 15 oz. of infusion of senna; add 2½ oz. of tincture of senna and 12 drachms of compound tincture of cardamom, and make up the bulk to 1 pint with infusion of senna.

This is intended to resemble "Black Draught."

Mistura Ferri Aromatica.—Macerate 1 oz. of powdered red cinchona bark, ½ oz. of powdered calumba root, ¼ oz. of bruised cloves, and ½ oz. of fine iron wire, in 12 oz. of peppermint water, for three days; filter, and add as much peppermint-water to the filter as will make the product measure 12½ oz.; then add 3 oz. of compound tincture of cardamom and ½ oz. of tincture of orange-peel.

This is commonly known as "Heberden's Ink." It contains *tannate* of iron.

Mistura Ferri Composita.—Take 9½ oz. of rose-water; triturate with a little of it, so as to form a thin paste, 60 grains each of myrrh and refined sugar, and 30 grains of carbonate of potassium; add to this 4 drachms of spirit of nutmeg and more of the rose-water until 8 oz. of a milky liquid is formed; then add 25 grains of sulphate of iron dissolved in the remainder of the rose-water; mix well, and preserve immediately from the air.

This is an imitation of "Griffiths' Mixture."

MUCILAGINES (MUCILAGES).

These are:—

Mucilago Acaciæ.
„ Amyli.
„ Tragacanthæ.

The first is made by dissolving 4 oz. of gum arabic in 6 oz. of water.

Mucilago Amyli is made by triturating 120 grains of starch with 10 oz. of water added gradually, and then boiling for a few minutes with stirring.

Mucilago Tragacanthæ is prepared by adding 2 drachms of rectified spirit to 60 grains of powdered tragacanth and trituration with 10 oz. of water.

In order to render oils or resinous tinctures emulsive with aqueous fluids, 3 drachms of mucilage of acacia are required for each oz., while 10 drachms are required to emulsify 1 oz. of copaiba (*Squire*).

Mucilago Acaciæ becomes sour on keeping, owing to the formation of acetic acid.

Mucilago Amyli is not strictly a solution, the starch being merely in a "state of excessive hydration."

Mucilage of gum acacia is an ingredient of all the lozenges, except those of opium; mucilage of starch forms the basis of all the enemata, except the enema asafœtida.

OLEA (OILS).

These are distilled or expressed; they are enumerated in the following table:—

CLASS I.

Distilled Oils.

(*a*) *From the fresh flowering herb.*

Oleum Menthæ Piperitæ.
„ Menthæ Viridis.
„ Rutæ.

Distilled Oils (*continued*).

(*b*) *From the fresh tops.*
Oleum Sabinæ.

(*c*) *From the leaves.*
Oleum Cajuputi.
,, Eucalypti.
,, Pini Sylvestris.

(*d*) *From the bark.*
Oleum Cinnamomi.

(*e*) *From the wood.*
Oleum Santali.

(*f*) *From the oleo-resin.*
Oleum Copaibæ.
,, Terebinthinæ.

(*g*) *From the flower.*
Oleum Anthemidis.
,, Caryophylli (unexpanded buds).
,, Lavandulæ.
,, Rosmarini (flowering tops).

(*h*) *From the fruit.*
Oleum Anethi.
,, Anisi.
,, Carui.
,, Coriandri.
,, Cubebæ.
,, Juniperi.
,, Pimentæ.

(*i*) *From the seed-kernel.*
Oleum Myristicæ.

(*j*) *Distilled with water from the seed after expression of the fixed oil.*
Oleum Sinapis.

Class II.

Expressed Oils.

(*a*) *From the fresh peel.*

Oleum Limonis.

This oil is sometimes distilled.

(*b*) *From the fruit.*

Oleum Olivæ.

(*c*) *From the seeds.*

Oleum Amygdalæ.
" Crotonis.
" Lini.
" Myristicæ Expressum.
" Ricini.
" Theobromatis.

Class III.

Phosphorated Oil.

Oleum Phosphoratum.—Heat fixed oil of almonds in a porcelain dish to 300°, and keep it at this temperature for about fifteen minutes; then let it cool, and filter it through paper. Put 4 fluid oz. of this oil into a stoppered bottle capable of holding $4\frac{1}{2}$ fluid oz., and add to it 16 grains of phosphorus. Immerse the bottle in hot water until the oil has acquired the temperature of 180°, removing the stopper two or three times to allow the escape of expanded air; then shake the oil and phosphorus together until the latter is entirely dissolved. In this process the oil is directed to be previously heated to 300°, in order to expel any water, and to coagulate any trace of albuminous matter present which might cause the precipitation of some of the phosphorus.

Characters.—A clear and colourless or but slightly coloured oil; phosphorescent in the dark. It contains 1 per cent. of phosphorus.

Heat is employed in the expression of *Oleum Theobromæ* and *Oleum Myristicæ Expressum.*

Oleum Morrhuæ is extracted from the fresh liver of Gadus Morrhua by a heat not exceeding 180° (p. 302).

The following are the preparations into the composition of which the oils enter:—

Oleum Amygdalæ in Oleum Phosphoratum, Unguentum Cetacei, Unguentum Resinæ, and Unguentum Simplex.

Oleum Anisi in Essentia Anisi, Tinctura Camphoræ Compositæ, and Tinctura Opii Ammoniata.

Oleum Anthemidis in Extractum Anthemidis.

Oleum Cajuputi in Linimentum Crotonis, and Spiritus Cajuputi.

Oleum Carui in Confectio Scammonii, and Pilula Aloes Barbadensis.

Oleum Caryophylli in Confectio Scammonii, Pilula Colocynthidis Composita, and Pilula Colocynthidis et Hyoscyami.

Oleum Coriandri in Syrupus Sennæ.

Oleum Crotonis in Linimentum Crotonis.

Oleum Eucalypti in Unguentum Eucalypti.

Oleum Juniperi in Spiritus Juniperi.

Oleum Lavandulæ in Linimentum Camphoræ Compositum, Spiritus Lavandulæ, and Tinctura Lavandulæ Composita.

Oleum Limonis in Linimentum Potassii Iodidi cum Sapone, and Spiritus Ammoniæ Aromaticus.

Oleum Menthæ Piperitæ in Aqua Menthæ Piperitæ, Essentia Menthæ Piperitæ, Pilula Rhei Composita, Spiritus Menthæ Piperitæ, and Tinctura Chloroformi et Morphinæ.

Oleum Menthæ Viridis in Aqua Menthæ Viridis.

Oleum Myristicæ in Pilula Aloes Socotrinæ, Spiritus Ammoniæ Aromaticus, and Spiritus Myristicæ.

Oleum Myristicæ Expressum in Emplastrum Calefaciens, and Emplastrum Picis.

Oleum Olivæ in Charta Epispastica, Emplastrum Ammoniaci cum Hydrargyro, Emplastrum Saponis Fuscum, Emplastrum Hydrargyri, Emplastrum Picis, Emplastrum Plumbi, Enema Magnesii Sulphatis, Linimentum Ammoniæ, Linimentum Calcis, Linimentum Camphoræ, Unguentum Cantharidis, Unguentum Hydrargyri Compositum, Unguentum Hydrargyri Nitratis, and Unguentum Veratrinæ.

Oleum Pini Sylvestris in Vapor Olei Pini Sylvestris.

Oleum Ricini in Collodium Flexile, Linimentum Sinapis Compositum, and Pilula Hydrargyri Composita.

Oleum Rosmarini in Linimentum Saponis, Spiritus Rosmarini, and Tinctura Lavandulæ Composita.

Oleum Sinapis in Linimentum Sinapis Compositum.

Oleum Terebinthinæ in Confectio, Enema, Linimentum, and Unguentum Terebinthinæ, and Linimentum Terebinthinæ Aceticum.

Oleum Theobromæ in all the suppositories.

OLEATA (OLEATES).

There are only two oleates in the British Pharmacopœia, viz. :—

Oleatum Hydrargyri.
" Zinci.

Oleatum Hydrargyri.—To 9 oz. of oleic acid, kept well-stirred in a mortar, add gradually 1 oz. of the yellow oxide of mercury, and triturate occasionally until all is dissolved.

Oleatum Zinci.—To 9 oz. of oleic acid in a mortar, stir 1 oz. of oxide of zinc, and allow the mixture to stand for two hours; then heat on a water-bath until the oxide is all dissolved. It is contained in the Unguentum Zinci Oleati.

PILULÆ (PILLS).

There are no less than twenty-one formulæ for the preparation of these : viz. :—

Pilula Aloes Barbadensis.
,, Aloes Socotrinæ.
,, Aloes et Asafœtidæ.
,, Aloes et Ferri.
,, Aloes et Myrrhæ.
,, Asafœtidæ Composita.
,, Cambogiæ Composita.
,, Colocynthidis Composita.
,, Colocynthidis et Hyoscyami.
,, Conii Composita.
,, Ferri Carbonatis.
,, Ferri Iodidi.
,, Hydrargyri.
,, Hydrargyri Subchloridi Composita.
,, Ipecacuanhæ cum Scilla.
,, Phosphori.
,, Plumbi cum Opio.
,, Rhei Composita.
,, Saponis Composita.
,, Scammonii Composita.
,, Scillæ Composita.

All the pills consist of several ingredients, and yet there is no satisfactory method of classifying them pharmaceutically. We will therefore consider them in alphabetical order, directing the special attention of the student to the ingredients and strength of these important preparations.

Pilula Aloes Barbadensis (1 in 2) :

Barbadoes aloes, 2 oz. ; hard soap, 1 oz. ; oil of caraway, 1 drachm ; confection of roses, 1 oz.

Pilula Aloes Socotrinæ (1 in 2):
Socotrine aloes, 2 oz.; hard soap, 1 oz.; oil of nutmeg 1 drachm; confection of roses, 1 oz.

Pilula Aloes et Asafœtidæ (1 of aloes and 1 of asafœtida in 4):
Socotrine aloes, asafœtida, hard soap, and confection of roses, of each 1 oz.

Pilula Aloes et Ferri (1 of aloes and ¾ of iron in 5¼):
Sulphate of iron, 1½ oz.; Barbadoes aloes, 2 oz.; compound powder of cinnamon, 3 oz.; confection of roses, 4 oz.

Pilula Aloes et Myrrhæ, "Rufus Pill" (1 of aloes and ½ of myrrh in 3):
Socotrine aloes, 2 oz.; myrrh, 1 oz.; saffron, ½ oz.; treacle, 1 oz.; glycerine, q. s.

Pilula Asafœtidæ Composita (1 of asafœtida, and 1 of galbanum in 3½):
Asafœtida, galbanum, and myrrh, of each 2 oz.; treacle, 1 oz.

Pilula Cambogiæ Composita (1 in 6):
Gamboge, Barbadoes aloes, and compound powder of cinnamon, of each 1 oz.; hard soap, 2 oz.; and a sufficiency of syrup.

Pilula Colocynthidis Composita (1 of colocynth, 2 of aloes, and 2 of resin of scammony in 6):
Colocynth, 1 oz.; Barbadoes aloes, 2 oz.; resin of scammony, 2 oz.; sulphate of potash, ¼ oz.; oil of cloves, 2 drachms; water, a sufficiency.

Pilula Colocynthidis et Hyoscyami:
Compound pill of colocynth, 2 oz.; extract of hyoscyamus, 1 oz.

Pilula Conii Composita (2½ of extract and ½ of ipecacuanha in 3):
Extract of hemlock, 2½ oz.; ipecacuanha, ½ oz.; and a sufficiency of treacle.

Pilula Ferri Carbonatis (1 of saccharo-carbonate in $1\frac{1}{4}$):
Saccharated carbonate of iron, 1 oz.; confection of roses, $\frac{1}{4}$ cz.

Pilula Ferri Iodidi (1 of iodide of iron in 3):
Fine iron wire, 40 grains; iodine, 80 grains; refined sugar, 70 grains; liquorice root, 140 grains; and distilled water, 50 minims.

Pilula Hydrargyri, "Blue Pill" (1 of mercury in 3):
Mercury, 2 oz.; confection of roses, 3 oz.; liquorice root, 1 oz.

Pilula Hydrargyri Subchloridi Composita, "Plummer's Pill" (1 of calomel in 5):
Calomel, 1 oz.; sulphurated antimony, 1 oz.; guaiacum resin, 2 oz.; castor oil, 1 oz.

Pilula Ipecacuanhæ cum Scilla (3 of Dover's powder in 7):
Compound powder of ipecacuanha, 3 oz.; squill, 1 oz.; ammoniacum, 1 oz.; and a sufficiency of treacle.

Pilula Phosphori ($\frac{1}{30}$ grain in 3 grains):
Phosphorus, 3 grains; balsam of Tolu, 120 grains; yellow wax, 57 grains; curd soap, 90 grains.

Pilula Plumbi cum Opio (6 of acetate of lead and 1 of opium in 8):
Acetate of lead, 36 grains; opium, 6 grains; confection of roses, 6 grains.

Pilula Rhei Composita (1 of rhubarb, $\frac{3}{4}$ of aloes in $4\frac{1}{2}$):
Rhubarb, 3 oz.; socotrine aloes, $2\frac{1}{4}$ oz.; myrrh, $1\frac{1}{2}$ oz.; hard soap, $1\frac{1}{2}$ oz.; oil of peppermint, $1\frac{1}{2}$ drachms; treacle, 3 oz.; glycerine, 1 oz.

Pilula Saponis Composita (1 of opium in 6):
Opium, $\frac{1}{2}$ oz.; hard soap, 2 oz.; water, a sufficiency.

Pilula Scammonii Composita:
Resin of scammony, resin of jalap, and powdered curd soap, of each 1 oz.; strong tincture of ginger, 1 oz.; rectified spirit, 2 oz.

Pilula Scillæ Composita (1 of squills in 5):

Squill, 1¼ oz.; ginger, ammoniacum, and hard soap, of each 1 oz.; treacle, 2 oz.

With regard to the *directions* for the preparation of the foregoing pills, the solid ingredients are to be powdered previously to being mixed, and as a general rule the simple direction is to mix the ingredients thoroughly so as to form a uniform mass. In the preparation of *Pilula Asafœtidæ Composita*, however, the ingredients are to be heated in a water-bath, and the mass stirred until it assumes a uniform consistence. In *Pilula Ferri Iodidi* the iron is to be agitated with the iodine and the water until the froth becomes white; the fluid is then to be poured on the sugar in a mortar, rubbed briskly, and the liquorice gradually added. In the *Pilula Hydrargyri*, the efficacy of the pill depends on the degree of extinction of the mercury, and hence we must be careful to rub the mercury with the confection of roses until the metallic globules are no longer visible; the liquorice is then to be added and well mixed. The following are the directions for the mode of preparing *Pilula Phosphori*:—Put the phosphorus and balsam of Tolu into a Wedgwood mortar about half full of hot-water, and when the phosphorus has melted and the balsam has become sufficiently soft, rub them together beneath the surface of the water until no particles of phosphorus are visible, the temperature of the water being maintained at or near to 140°. Add now the wax, and as it softens mix it thoroughly with the other ingredients. Allow the mass to cool without being exposed to the air, and keep it in a bottle immersed in cold water. It may be softened with a few drops of rectified spirit when made into pills, one grain of the soap being then incorporated with every two grains of the product.

In making *Pilula Scammonii Composita*, add the spirit and tincture to the soap and resins, and dissolve with the aid of a gentle heat; then evaporate the spirit by the heat of a water-bath until the mass has acquired a suitable consistence for forming pills. This is the only aperient pill in the Pharmacopœia which does not contain aloes.

Pilula Hydrargyri probably consists of minutely divided metallic mercury combined with mercurous oxide (Hg_2O). It sometimes contains subsulphate of mercury as an adulteration, from the fact of sulphuric acid having been added to the confection of roses to improve its colour; it is detected by rubbing the pill mass with boiling-water, and adding solution of nitrate of baryta—a white precipitate, insoluble in nitric acid, resulting.

Pilula Hydrargyri Subchloridi Composita becomes partially decomposed by long keeping, chloride of antimony and sulphuret of mercury resulting.

In *Pilula Plumbi cum Opio*, which is in imitation of "Graves's Pill," a decomposition is also said to take place, acetate of morphia and meconate of lead being formed.

PULVERES (POWDERS).

There are fifteen in the Pharmacopœia, viz :—

Pulvis Amygdalæ Compositus.
,, Antimonialis.
,, Catechu Compositus.
,, Cinnamomi Compositus.
,, Cretæ Aromaticus.
,, Cretæ Aromaticus cum Opio.
,, Elaterini Compositus.
,, Glycyrrhizæ Compositus.
,, Ipecacuanhæ Compositus.
,, Jalapæ Compositus.
,, Kino Compositus.
,, Opii Compositus.
,, Rhei Compositus.
,, Scammonii Compositus.
,, Tragacanthæ Compositus.

All these are of complex constitution; and as there is no satisfactory method of classifying them pharmaceutically, they had best be considered in alphabetical order.

Pulvis Amygdalæ Compositus (8 in 13).

Blanched Jordan almonds, 8 oz.: refined sugar, 4 oz.; gum acacia, 1 oz.

This was formerly the "Confectio Amygdalæ." One oz. of it with 8 oz. of water forms the *Mistura Amygdalæ* of the present Pharmacopœia.

Pulvis Antimonialis (1 of oxide of antimony in 3):

Oxide of antimony, 1 oz.; precipitated phosphate of calcium, 2 oz.

Intended as a substitute for "James' Powder," of which, however, antimonious acid makes up the bulk.

Pulvis Catechu Compositus (1 in $2\frac{1}{2}$):

Pale catechu, 4 oz.; kino and rhatany root, of each, 2 oz.; cinnamon bark and nutmeg, of each, 1 oz.

Pulvis Cinnamomi Compositus (1 in 3):

Cinnamon bark, cardamom seeds, and ginger, of each 1 oz.

Pulvis Cretæ Aromaticus (1 in 4):

Cinnamon bark, 4 oz.; nutmeg and saffron, of each, 3 oz.; cloves, $1\frac{1}{2}$ oz.; cardamom seeds, 1 oz.; refined sugar, 25 oz.; prepared chalk, 11 oz.

Pulvis Cretæ Aromaticus cum Opio (1 of opium in 40):

Aromatic chalk-powder, $9\frac{3}{4}$ oz.; opium, $\frac{1}{4}$ oz.

Pulvis Elaterini Compositus (1 in 40):

Elaterin, 5 grains; sugar of milk, 195 grains.

Pulvis Glycyrrhizæ Compositus:

Senna, in fine powder, powdered liquorice root, of each, 2 oz.; 1 oz. each of powdered fennel fruit and sublimed sulphur; refined sugar in powder, 6 oz.

Pulvis Ipecacuanhæ Compositus (1 of opium in 10):

Ipecacuanha and opium, of each, ½ oz.; sulphate of potassium, 4 oz.

This is commonly known as "Dover's Powder," of which, however, it is not an exact imitation. The use of the sulphate of potassium is to promote the minute division and intermixture of the opium and ipecacuanha. If this powder be kept for any length of time the bottle containing it should be well shaken before dispensing it, as the sulphate of potassium is apt to sink to the bottom.

Pulvis Jalapæ Compositus (1 in 3):

Jalap, 5 oz.; acid tartrate of potassium, 9 oz.; ginger, 1 oz.

The acid tartrate of potassium not only assists in the minute division of the jalap, but also promotes the hydragogue effects.

Pulvis Kino Compositus (1 of opium in 20):

Kino, 3¾ oz.; opium, ¼ oz.; cinnamon bark, 1 oz.

Pulvis Opii Compositus (1 of opium in 10):

Opium, 1½ oz.; black pepper, 2 oz.; ginger, 5 oz.; caraway fruit, 6 oz.; tragacanth, ½ oz.

Pulvis Rhei Compositus (1 in 4½):

Rhubarb root, 2 oz.; light magnesia, 6 oz.; ginger, 1 oz.

Known as "Gregory's Powder."

Pulvis Scammonii Compositus (1 in 2):

Resin of Scammony, 4 oz.; jalap, 3 oz.; ginger, 1 oz.

Pulvis Tragacanthæ Compositus:

Tragacanth, gum acacia, and starch, of each, 1 oz.; refined sugar, 3 oz.

Chiefly used as a vehicle for heavy insoluble powders.

The general direction "to mix the ingredients thoroughly, pass the powder through a light sieve, rub it lightly in a mortar, and preserve it in a stoppered bottle," may be said to apply to all the powders. The several ingredients, before mixing, are to be finely powdered.

The following are the preparations into which some of the powders enter :—

Pulvis Amygdalæ Compositus in Mistura Amygdalæ.

Pulvis Cinnamomi Compositus in Pilula Aloes et Ferri, and Pilula Cambogiæ Composita.

Pulvis Ipecacuanhæ Compositus in Pilula Ipecacuanhæ cum Scilla.

Pulvis Opii Compositus in Confectio Opii.

SPIRITUS (SPIRITS).

Including rectified spirit and proof spirit there are eighteen formulæ for use in the Pharmacopœia, viz. :—

Spiritus Ætheris.
,, Ætheris Compositus.
,, Ætheris Nitrosi.
,, Ammoniæ Aromaticus.
,, Ammoniæ Fœtidus.
,, Armoraciæ Compositus.
,, Cajuputi.
,, Camphoræ.
,, Chloroformi.
,, Cinnamomi.
,, Juniperi.
,, Lavandulæ.
,, Menthæ Piperitæ.
,, Myristicæ.
,, Rectificatus.
,, Rosmarini.
,, Tenuior.
,, Vini Gallici.

Spiritus Rectificatus, "Rectified Spirit," or spirit of wine, contains 84 per cent. by weight, or 89 by volume, of absolute alcohol (C_2H_6O), and is obtained by distillation of fermented saccharine fluids. Under the influence of the ferment (*Torula Cerevisiæ*), at between 60° and 80°, the sugar is converted into alcohol and carbonic acid—

$$C_6H_{12}O_6 = 3CO_2 + 2C_2H_6O.$$

Spiritus Tenuior, "Proof Spirit"* contains 49 per cent. by weight, or 57 by volume, of absolute alcohol, and is made by diluting 5 pints of rectified spirit with 3 pints of water.

The specific gravity of *Spiritus Rectificatus* is 0·838; that of *Spiritus Tenuior* is 0·920.

The Pharmacopœia directs the following tests for the purity of *Spiritus Rectificatus.* It should remain clear on adding to it distilled water. Four fluid oz. of it with thirty grain-measures of the volumetric solution of nitrate of silver exposed for twenty-four hours to bright sunlight and then decanted from the black powder which has formed, should undergo no further change when again exposed to light with more of the test. This test indicates that Amylic Alcohol (Fousel Oil), or Aldehyde, is not present in excess. Rectified spirit, when perfectly pure, does not reduce nitrate of silver.

Absolute alcohol and proof spirit may be similarly tested.

Alcohol Ethylicum or *Absolute Anhydrous Alcohol* is thus prepared :—

Put 2 oz. of anhydrous carbonate of potassium and 1 pint of rectified spirit into a stoppered bottle and allow them to remain in contact for two days, frequently shaking the bottle. Expose a quantity of chloride of calcium to a red heat in a covered crucible for half an hour, then remove it from the fire, and, when it has cooled, immediately put the fused mass into a flask or retort, and add to it the spirit from which the denser aqueous solution of carbonate of potassium, which will have formed a distinct stratum at the bottom of the bottle, has been carefully and completely separated. Attach a condenser to the apparatus, and allow it to remain without any external application of heat for twenty-four hours; then applying a gentle heat, let the spirit distil until that which has passed over shall measure 2 fluid oz.; return this, and continue the distillation into a fresh receiver until the product measures 15 fluid oz. In this process the deliquescent carbonate of potassium, which is insoluble in alcohol, absorbs most of the water from it, and the dried chloride of calcium removes the remainder.

---

* When the specific gravity is ·920 it is said to be "proof;" when the specific gravity is lower than this it is termed "above proof;" and when the specific gravity is higher it is termed "under proof."

Absolute alcohol thus obtained should be colourless and free from empyreumatic odour; sp. gr. 0·797. It is entirely volatile by heat, and is not rendered turbid when mixed with water, showing the absence of essential oil or resin. It should not cause anhydrous sulphate of copper to assume a blue colour when left in contact with it, showing it is free from water. It is a powerful solvent of many substances, but does not dissolve common salt, which is soluble in rectified spirit.

Amylic Alcohol, "Oil of Grain, or Fousel Oil" ($C_5H_{12}O$), is an oily liquid contained in the crude spirit produced by the fermentation of saccharine solutions with yeast, and separated in the rectification or distillation of such crude spirit. It is a colourless liquid with a penetrating and oppressive odour and a burning taste. When pure its sp. gr. is 0·818, and its boiling-point 270°. It is sparingly soluble in water, but soluble in all proportions in alcohol, ether, and essential oils. By the action of oxidizing agents—*e.g.*, with platinum black—it is converted into valerianic acid, which corresponds to acetic acid in the ethyl series. It is introduced into the Pharmacopœia for the preparation of valerianate of sodium.

Spiritus Vini Gallici, "Spirit of French Wine," "Brandy." Spirit distilled from French Wine. It contains about 55 per cent. by measure of alcohol according to brand, together with some volatile and œnanthic ether. When first distilled it is nearly white, but afterwards acquires a brownish colour from the cask in which it is kept.

The remaining spirits may be conveniently divided into SIMPLE and COMPLEX—the former including those which are merely solutions in, or mixture with, rectified spirit.

SIMPLE SPIRITS.

Spiritus Ætheris is made by mixing 10 oz. of ether with 20 oz. of rectified spirit. Its specific gravity should be 0·809.

Spiritus Chloroformi, intended to represent "Chloric Ether," which, however, is much stronger. It is prepared by dissolving 1 oz. of chloroform in 19 oz. of rectified spirit. Its specific gravity should be 0·871. It differs from chloroform in being readily ignited. It yields a green colour with bichromate of potassium and sulphuric acid.

Spiritus Camphoræ, the old "Tinctura Camphoræ." Made by dissolving 1 oz. of camphor in 9 oz. of rectified spirit. It is decomposed by water, the greater part of the camphor separating.

Spiritus Cajuputi, *Spiritus Cinnamomi*, *Spiritus Juniperi*, *Spiritus Lavandulæ*, *Spiritus Menthæ Piperitæ*, *Spiritus Myristicæ*, and *Spiritus Rosmarini*, are all made by dissolving 1 oz. of the respective volatile oils in 49 oz. of rectified spirit.

Complex Spirits.

Spiritus Ætheris Compositus, "Hoffmann's Anodyne."

Preparation.—Gradually mix 36 fluid oz. of sulphuric acid with 40 fluid oz. of rectified spirit, and let the mixture stand for 24 hours. Then distil until the fluid in the retort begins to blacken. Shake the distillate with lime-water to neutralise any acid, and remove the supernatant liquor and expose it to the air for about 12 hours. Pour 3 fluid drachms of the resulting liquid into a mixture of 8 fluid oz. of ether and 16 fluid oz. of rectified spirit.

Spiritus Ætheris Nitrosi, "Sweet Spirit of Nitre." A spirituous solution containing nitrous ether ($C_2H_5NO_2$).

Preparation.—Add 1 pint of rectified spirit gradually to 2 oz. of sulphuric acid, and then add gradually 2½ oz. of nitric acid. Put the mixture into a retort containing 2 oz. of fine copper wire, and distil at a temperature of between 170° and 180° until 12 oz. have passed over. Withdraw the heat now, and when the contents of the retort have cooled, add 2½ oz. more of nitric acid, and re-distil until the distillate has increased to 15 oz. Mix this with 2 pints of rectified spirit, or as much as will make the product of the same specific gravity and percentage of ether separated by chloride of calcium.

The following is the *rationale* of the above process, which was proposed by Mr. Redwood :—The sulphuric acid decomposes the alcohol, forming ether, and this is converted into nitrous ether by the nitrous acid which is generated by the action of the copper on the nitric acid. The following equation indicates the decomposition as a whole :—

$$C_2H_5HO + HNO_3 + Cu + H_2SO_4 = \underbrace{C_2H_5NO_2}_{\textit{Nitrous Ether or Nitrite of Ethyl.}} + CuSO_4 + 2H_2O.$$

The Pharmacopœia gives the following characters and tests :—

"Transparent and nearly colourless, with a very slight tinge of yellow, mobile, inflammable, of a peculiar, penetrating, apple-like odour, and sweetish, cooling, sharp taste. Specific gravity 0·845. It effervesces feebly or not at all when shaken with a little bicarbonate of sodium (showing the absence of free acid). When agitated with solution of sulphate of iron and a few drops of sulphuric acid, it becomes deep olive-brown or black (due to the formation of nitric oxide). If it be agitated with twice its volume of saturated solution of chloride of calcium in a closed tube, 2 per cent. of its original volume will separate in the form of nitrous ether, and rise to the surface of the mixture (showing that 10 per cent. of nitrous ether is present, 8 per cent. always remaining unseparated)."

Spiritus Ammoniæ Aromaticus, "Sal Volatile," a spirituous solution of ammonia, neutral carbonate of ammonium, and oils of nutmeg and lemon. It is prepared by mixing oil of lemon, 6½ drachms, volatile oil of nutmeg, 4½ drachms, with 6 pints of rectified spirit in a retort; distil 7 pints, and then distil and collect separately 9 fluid oz. To the last 9 oz. of distillate add carbonate of ammonium 4 oz., and strong solution of ammonia 8 fluid oz., and heat over water-bath until solution has taken place. Filter, and gradually mix with the 7 pints of distillate. To measure a gallon.

Spiritus Ammoniæ Fœtidus, a spirituous solution of the volatile oil of asafœtida with solution of ammonia. It is prepared by macerating 1½ oz. of asafœtida in 15 oz. of rectified spirit for 24 hours, distilling off the spirit, mixing the product with 2 oz. of strong solution of ammonia, and adding sufficient spirit to make up the bulk to 1 pint.

Spiritus Armoraciæ Compositus (1 in 8):

Made by distilling, with a moderate heat, 1 gallon of a mixture of 20 oz. each of scraped fresh horseradish-root and bitter orange-peel, ½ oz. of bruised nutmeg, 1 gallon of proof spirit, and 2 pints of water.

The following are the preparations into the composition of which the spirits enter:—

Spiritus Ætheris in Tinctura Lobeliæ Ætherea.

Spiritus Ammoniæ Aromaticus in Tinctura Guaiaci Ammoniata and in Tinctura Valerianæ Ammoniata.

Spiritus Cinnamomi in Acidum Sulphuricum Aromaticum.

Spiritus Juniperi in Mistura Creasoti.

Spiritus Myristicæ in Mistura Ferri Composita.

Spiritus Vini Gallici in Mistura Spiritus Vini Gallici.

Spiritus Rectificatus and *Spiritus Tenuior* in many tinctures.

SUCCI (JUICES).

Of these there are seven, viz.:—

Succus Belladonnæ.
„ Conii.
„ Hyoscyami.
„ Scoparii.
„ Taraxaci.
„ Limonis.
„ Mori.

The first five are prepared by pressing out the juice from 7 lb. of the fresh bruised plants, and to every 3 measures of juice so expressed adding 1 of rectified spirit to preserve from decomposition; the product is then set aside for seven days, filtered, and kept in a cool place.

Succus Limonis and *Succus Mori* are merely the fresh expressed juices of the ripe fruits. They are more fully considered in Part I.

SUPPOSITORIA (SUPPOSITORIES).

These are solid bodies for introduction into the rectum. There are eight of them in the Pharmacopœia :—

Suppositorium Acidi Carbolici cum Sapone.
,, Acidi Tannici.
,, Acidi Tannici cum Sapone.
,, Hydrargyri.
,, Iodoformi.
,, Morphinæ.
,, Morphinæ cum Sapone.
,, Plumbi Compositum.

They may be divided into two groups, one embracing the suppositories of tannic acid, of mercury, of iodoform, of morphine, and the compound suppository of lead. These are made by melting oil of theobroma by a gentle heat; the active principle is rubbed with it in a mortar, and the ingredients thoroughly mixed; the mixture is then poured, while it is fluid, into suitable moulds of the capacity of 15 grains.

The following table gives their composition and strength :—

Suppository.	Each contains.	Active Ingredients.	Oil of Theobroma.
			grs.
S. ACID. TANNIC.	3 grs. of Tannic Acid	Tannic Acid, 36 grs.	144
S. HYDRARGYRI	5 grs. of Mercurial Ointment	Mercurial Ointment, 60 grs.	120
S. IODOFORMI	3 grs. of Iodoform	Iodoform, 36 grs.	144
S. MORPHINÆ	½ gr. of Hydrochlorate of Morphine	Hydrochlorate of Morphine, 6 grs.	174
S. PLUMBI COMP.	3 grs. of Acetate of Lead, and 1 gr. of Opium	Acetate of Lead, 36 grs., Opium, 12 grs.	132

The other group includes *Suppositoria Acidi Carbolici cum Sapone*, *Suppositoria Morphinæ cum Sapone*, and *Suppositoria*

Acidi Tannici cum Sapone. These are made by mixing the active ingredient with glycerine of starch and curd soap, and adding sufficient starch to form a paste of suitable consistence. The mass is then divided into twelve equal parts, each of which is to be made into a conical or other convenient form for a suppository.

Their composition may be thus tabulated :—

Name.	Active Ingredient.	Curd Soap.	Starch.	Glycerine of Starch.
S. ACIDI CARBOLICI CUM SAPONE	Carbolic Acid, 12 grs.	180 grs.	—	40 grs. or q.s.
S. ACIDI TANNICI CUM SAPONE	Tannic Acid, 36 grs.	100 grs.	q.s.	30 grs.
S. MORPHINÆ CUM SAPONE	Hydrochlorate of Morphine, 6 grs.	100 grs.	q.s.	30 grs.

SYRUPI (SYRUPS).

Aqueous solutions of substances saturated with sugar. The following are the sixteen official syrups, with the strength of each :—

Syrupus Aurantii (*Tincture*), 1 in 8.
,, Aurantii Floris, 1 in 6¾.
,, Chloral, 10 grs. in each drachm.
,, Ferri Iodidi, 4⅓ grs. in each drachm.
,, Ferri Phosphatis, 1 gr. in each drachm.
,, Hemidesmi, 1 in 8.
,, Limonis (*Juice*), 1 in 2.
,, Mori (*Juice*), 1 in 2.
,, Papaveris (*Capsules*), 1 in 2¼.
,, Rhei (*Root*), 1 in 14.
,, Rhœados (*Petals*), 1 in 3¼.
,, Rosæ Gallicæ (*Petals*), 1 in 17½.
,, Scillæ, 1 in 17.
,, Sennæ, 1 in 2.
,, Tolutanus, 1 in 28⅘.
,, Zingiberis (*Strong Tincture*), 1 in 20 (nearly).

The following table gives the ingredients, product, and specific gravity of the syrups :—

Syrup.	Ingredients.	Product.		Sp. Gr.
		lbs.	ozs.	
Syrupus	Refined sugar, 5 lbs. Distilled water, 2 pints	7½	0	1·330
S. Scillæ	Refined sugar, 2½ lbs. Vinegar of squill, 1 pint	—		1·345
S. Limonis	Refined sugar, 2¼ lbs. Fresh lemon peel, 2 ozs. Lemon juice, 1 pint	3½	0	1·34
S. Aurantii Floris	Orange-flower water, 8 ozs. Refined sugar, 3 lbs. Distilled water, 16 ozs.	4½	0	1·330
S. Tolutanus	Balsam of Tolu, 1¼ ozs. Refined sugar, 2 lbs. Distilled water, 1 pint	3	0	1·330
S. Hemidesmi	Hemidesmus root, 4 ozs. Refined sugar, 28 ozs. Boiling distilled water, 1 pint	2	10	1·335
S. Rosæ Gallicæ	Dried red-rose petals, 2 ozs. Refined sugar, 30 ozs. Boiling distilled water, 1 pint	2	14	1·335
S. Chloral	Hydrate of chloral, 80 grs. Distilled water, 4 drms. Simple syrup, 4 drms.	0	1	1·320
S. Ferri Iodidi	Fine iron wire, 1 oz. Iodine, 2 ozs. Refined sugar, 28 ozs. Distilled water, 13 ozs.	2	11	1·385
S. Ferri Phosphatis	Granulated sulphate of iron, 224 grs. Phosphate of sodium, 200 grs. Bicarbonate of sodium, 56 grs. Concentrated phosphoric acid, 1¼ ozs. Refined sugar, 8 ozs. Distilled water, 8 ozs.	0	12	1·305
S. Mori	Mulberry juice, 1 pint Refined sugar, 2¼ lbs. Rectified spirit, 2½ ozs.	3	6	1·33

SYRUPI (*continued*).

Syrup.	Ingredients.	Product.		Sp. Gr.
		lbs.	ozs.	
S. RHÆADOS	Fresh red-poppy petals, 13 ozs. Refined sugar, 2½ lbs. Distilled water, 1 pint Rectified spirit, 2½ ozs.	3	10	1·330
S. RHEI	Rhubarb root, } each, 2 ozs. Coriander fruit, } Refined sugar, 24 ozs. Distilled water, 24 ozs. Rectified spirit, 8 ozs.	—		—
S. SENNÆ	Senna, 16 ozs. Oil of coriander, 3 mins. Refined sugar, 24 ozs. Distilled water, 5 pints Rectified spirit, 3 fl. ozs.	2	10	1·310
S. PAPAVERIS	Poppy capsules (dried and freed from seeds), 36 ozs. Refined sugar, 4 lbs. Boiling distilled water, q.s. Rectified spirit, 16 ozs.	6½	0	1·330
S. AURANTII	Tincture of orange peel, 1 oz. Syrup, 7 ozs.	—		1·282
S. ZINGIBERIS	Strong tincture of ginger, 6 drms. Syrup, 19 ozs.	—		—

For the directions for the preparation of the Syrups reference must be made to the Pharmacopœia. We have not here given the processes, for the details are, in the majority of instances, complicated. The *modus operandi* in the case of *Syrupus Ferri Iodidi* and *Syrupus Ferri Phosphatis* requires, however, the attention of the student.

In the preparation of *Syrupus Ferri Iodidi* the iron, iodine, and 3 oz. of the water are to be shaken well together until the froth of the mixture becomes white; a syrup having been made with the sugar and 10 oz. of the water, the solution of iodide of iron is to be filtered into it while it is still hot. It contains $4\frac{1}{3}$ grains in each drachm.

Syrupus Ferri Phosphatis is a solution of freshly precipitated phosphate of iron in concentrated phosphoric acid, converted into a syrup by the addition of sugar, which prevents the peroxidation of the iron. Each drachm contains 1 grain of the anhydrous phosphate ($Fe_3 2PO_4$).

Syrups are best kept in full bottles, otherwise the sugar is apt to crystallise from concentration of the syrup. Syrups containing too little sugar are apt to undergo vinous fermentation. This condition may be known by the formation of froth on the surface, a vinous odour, and diminished consistence. The froth is due to the disengagement of carbonic acid gas ; the odour is due to the presence of alcohol, and the diminished consistence to the loss of the sugar. According to Macculloch, the presence of chlorate of potassium will prevent fermentation in syrups.

Syrupus Papaveris made by the present process is not so liable to ferment as formerly, rectified spirit being now employed to remove the matter which caused fermentation. *Syrupus Sennæ* is also no longer liable to ferment.

Syrupus Limonis when kept too long is apt to deposit grape-sugar.

In *Syrupus Ferri Iodidi* the sugar does *not* effectually prevent decomposition. The best means of preserving the iodide of iron in its integrity is that proposed by Mr. Squire—viz., suspending a coil of iron wire in the bottle containing it.

Syrupus Ferri Phosphatis becomes brown when long kept, and this has been attributed to the production of peracetate of iron from the presence of a small quantity of acetic acid ; it is, however, more probably due to the action of phosphoric acid on the sugar.

Syrupus enters into the composition of Mistura Cretæ, Maistur Creasoti, Pilula Cambogiæ Composita, Syrupus

Aurantii, Syrupus Chloral, Syrupus Zingiberis, Tincture Chloroformi et Morphinæ, and the Confectio Opii and Confectio Scammonii.

Syrupus Aurantii is an ingredient of Confectio Sulphuris.

TINCTURA (TINCTURES).

These are spirituous solutions of substances the active principles of which are imperfectly soluble in water, or whose aqueous solutions are not stable. There are no less than 72 tinctures. These are named and classified, according to their strength, in the following table :—

1 in 2 :—

Tinctura Zingiberis Fortior.

1 in 3 (?) :—

Tinctura Aurantii Recentis.

1 in 4 :—

Tinctura Ergotæ.
,, Ferri Acetatis
,, ,, Perchloridi (*Liquor*).
,, Jaborandi.

1 in 8 :—

Tinctura Aconiti.
,, Asafœtidæ.
,, Buchu.
,, Calumbæ.
,, Cascarillæ.
,, Catechu.
,, Chiratæ.
,, Chloroformi et Morphinæ.
,, Cimicifugæ.
,, Cinnamomi.
,, Cocci.
,, Colchici Seminum.
,, Conii.

Tinctura Cubebæ.
„ Digitalis.
„ Gallæ.
„ Gelsemii.
„ Hyoscyami.
„ Jalapæ.
„ Krameriæ.
„ Laricis.
„ Limonis.
„ Lobeliæ.
„ Lobeliæ Ætherea.
„ Lupuli.
„ Myrrhæ.
„ Sabinæ.
„ Scillæ.
„ Senegæ.
„ Sennæ.
„ Serpentariæ.
„ Stramonii.
„ Sumbuli.
„ Tolutana.
„ Valerianæ.
„ Valerianæ Ammoniata.
„ Zingiberis.

1 in 5 :—

Tinctura Cinchonæ.
„ Guaiaci Ammoniata.
„ Pyrethri.
„ Veratri Viridis.

1 in 10 :—

Tinctura Aurantii.
„ Benzoini Composita.
„ Chloroformi Composita.

Tinctura Cinchonæ Composita.
,, Kino.
,, Rhei.

1 in 13 (nearly) :—

Tinctura Nucis Vomicæ.

1 in 20 :—

Tinctura Arnicæ.
,, Belladonnæ.
,, Cannabis Indicæ (*Extract*).
,, Croci.

1 in 40 :—

Tinctura Aloes.
,, Iodi.

1 in 60 :—

Tinctura Quininæ.
,, Quininæ Ammoniata.

1 in 80 :—

Tinctura Cantharidis.
,, Cardamomi Composita.

1 in 13⅓ :—

Tinctura Gentianæ Composita.
,, Opii.

1 in 27 :—

Tinctura Capsici.
,, Quassiæ.

1 in 54½ :—

Tinctura Podophylli.

1 in 96 :—

Tinctura Opii Ammoniata.

1 in 213 :—

Tinctura Lavandulæ Composita.

Tinctura Camphoræ Composita has 1 of opium, 1 of benzoic acid, and ¾ of camphor in 240.

Different menstrua are used in the preparation of these tinctures :—

Rectified Spirit is used in preparing tinctures of those substances which contain much resin or volatile oil, as in *Tinctura Aconiti, Arnicæ, Asafœtidæ, Aurantii Recentis, Benzoini Composita, Cannabis Indicæ, Capsici, Cinnamomi, Cubebæ, Kino, Laricis, Lavandulæ Composita, Myrrhæ, Podophylli, Pyrethri Sumbul, Tolutana, Veratri Viridis, Zingiberis Fortior, Zingiberis.* It is also used in the preparation of *Tinctura Chloroformi Composita, Chloroformi et Morphinæ, Ferri Acetatis, Ferri Perchloridi, Iodi,* and *Tinctura Opii Ammoniata.*

Proof Spirit is used in the preparation of all the remaining tinctures, except *Tinctura Guaiaci Ammoniata* and *Tinctura Valerianæ Ammoniata,* in which Aromatic Spirit of Ammonia is employed ; *Tinctura Opii Ammoniata,* in which strong solution of Ammonia and Rectified Spirit is employed ; and *Tinctura Quininæ Ammoniata,* in which strong solution of Ammonia and Proof Spirit is used. The *Tinctura Nucis Vomicæ* is now made by dissolving 133 grains of the extract in 4 fl. oz. of water, to which sufficient rectified spirit has been added to make up one pint. One ounce contains 1 grain of the alkaloids. An "Ethereal Tincture," *Tinctura Lobeliæ Ætherea,* in which Spirit of Ether is used ; and one in which Tincture of Orange is used—viz., *Tinctura Quininæ.*

Proof spirit is adapted to make tinctures of such substances as are partly soluble in water and partly in spirit.

The following are the processes according to one or other of which, with the exception of *Tinctura Ferri Acetatis,* all the tinctures are made :—

1st. SIMPLE SOLUTION OR MIXTURE.—*Tinctura Cannabis*

Indicæ, Chloroformi Composita, Chloroformi et Morphinæ, Ferri Acetatis, Ferri Perchloridi, Iodi, Podophylli.

2nd. MACERATION.—Macerate the drug in all, or 15 oz. of, the spirit for seven days in a closed vessel, occasionally agitating, filter (in many cases press and strain), and add sufficient spirit to make 1 pint. *Tinctura Aloes, Asafœtidæ, Aurantii, Aurantii Recentis, Benzoini Composita, Camphoræ Composita, Cantharidis, Catechu, Cocci, Guaiaci Ammoniata, Kino, Limonis, Lobeliæ Ætherea, Opii, Opii Ammoniata, Quassiæ, Tolutana, Valerianæ Ammoniata.*

The preparation of *Tinctura Lavandulæ Composita* is somewhat exceptional. After macerating the solid ingredients in the spirit, straining and pressing as above, the oils are dissolved in the strained tincture, filtered, and sufficient spirit added to make up to 2 pints. In *Tinctura Tolutana* the balsam of Tolu is macerated in 15 oz. of the spirit for six hours only, or until the balsam is dissolved. In *Tinctura Quininæ* the sulphate of quinine is dissolved in the tincture of orange-peel by the aid of a gentle heat. The solution is allowed to remain for three days in a closed vessel, occasionally agitating it, and is finally filtered.

3rd. PERCOLATION.—Pack in a percolator, pour on half a pint of the spirit, two hours after add more spirit, and percolate slowly until 1 pint is collected. *Tinctura Zingiberis Fortior.*

4th. MACERATION AND PERCOLATION.—Macerate the drug for forty-eight hours in 15 oz. of the spirit in a closed vessel, occasionally agitating; transfer to a percolator, and when the fluid no longer passes, continue the percolation with 5 oz. more of the spirit. Then press the contents of the percolator, filter the products, mix the liquids, and, lastly, add sufficient spirit to make 1 pint. All the remaining tinctures are made according to this process.

In the preparation of most tinctures the drugs are directed to be cut small or bruised, or coarsely powdered, etc.

All the tinctures are simple except those enumerated in the following table, and *Tinctura Aloes*, which has 1½ oz. of extract of liquorice added to hide the taste and to suspend the aloes in the spirit; *Tinctura Catechu*, in the preparation of which 1 oz. of cinnamon bark is used; *Tinctura Iodi*, which contains ¼ oz. of iodide of potassium to aid in the solution of the iodine; and *Tinctura Ferri Acetatis*, to which 1 oz. of acetic acid is added.

Tinctura Opii Ammoniata, *Tinctura Rhei*, and *Tinctura Sennæ*, are compound in every sense, and as such are included in the following table:—

TABLE OF INGREDIENTS OF COMPOUND TINCTURES.

Tinctura Opii Ammoniata.

Opium - - - - -	100 grs.
Saffron - Benzoic Acid } each - - -	180 grs.
Oil of Anise- - - - -	1 drm.
Strong solution of Ammonia - -	4 oz.
Rectified Spirit - - - -	16 oz.

Contains 1 gr. of opium in 96 mins.

Tinctura Rhei.

Rhubarb - - - - -	2 oz.
Cardamom Seeds (freed from pericarps) Coriander Fruit - - - Saffron - - - - } each	¼ oz.
Proof Spirit - - - - -	1 pint.

Tinctura Sennæ.

Senna - - - - -	2½ oz.
Raisins - - - - -	2 oz.
Caraway Fruit Coriander Fruit } each - - -	½ oz.
Proof Spirit - - - - -	1 pint.

Tinctura Benzoini Composita.

Benzoin	2 oz.
Prepared Storax	1½ oz.
Balsam of Tolu	½ oz.
Socotrine Aloes	160 grs.
Rectified Spirit	1 pint.

Tinctura Camphoræ Composita.

Opium Benzoic Acid } each	40 grs.
Camphor	30 grs.
Oil of Anise	½ drm.
Proof Spirit	1 pint.

One gr. of opium is contained in ½ oz.

Tinctura Cardamomi Composita.

Cardamom Seeds (freed from pericarps)	¼ oz.
Caraway Fruit	¼ oz.
Raisins	2 oz.
Cinnamon Bark	½ oz.
Cochineal	60 grs.
Proof Spirit	1 pint.

Tinctura Cinchonæ Composita.

Pale Cinchona Bark	2 oz.
Bitter Orange Peel	1 oz.
Serpentary Rhizoma	½ oz.
Saffron	55 grs.
Cochineal	28 grs.
Proof Spirit	1 pint.

Tinctura Chloroformi Composita.

Chloroform	2 oz.
Compound Tincture of Cardamoms	10 oz.
Rectified Spirit	8 oz.

Tinctura Chloroformi et Morphinæ.

Chloroform	1 oz.
Ether	2 drms.
Rectified Spirit	1 oz.
Hydrochlorate of Morphine	8 grs.
Diluted Hydrocyanic Acid	4 drms.
Oil of Peppermint	4 mins.
Liquid Extract of Liquorice	1 oz.
Treacle	1 oz.
Syrup	q.s.

(To measure 8 fluid oz.)

It contains $\frac{1}{48}$ gr. of morphine in 10 mins.

Tinctura Gentianæ Composita.

Gentian Root	$1\frac{1}{2}$ oz.
Bitter Orange Peel	$\frac{3}{4}$ oz.
Cardamom Seeds (freed from pericarps)	$\frac{1}{4}$ oz.
Proof Spirit	1 pint.

Tinctura Lavandulæ Composita.

Oil of Lavender	$1\frac{1}{2}$ drms.
Oil of Rosemary	10 mins.
Cinnamon Bark Nutmeg } each	150 grs.
Red Sandal-wood	300 grs.
Rectified Spirit	2 pints.

Several tinctures become milky when added to aqueous fluids, owing to the precipitation of resinous or oily matters, as *Tinctura Asafœtidæ*, *Benzoini Composita*, *Cannabis Indicæ*, *Cubebæ*, *Guaiaci Ammoniata*, *Jalapæ*, *Myrrhæ*, and *Tolutana*. If mucilage of gum acacia be rubbed up with the tincture before adding water the insoluble matters will be suspended.

A few of the tinctures spoil by keeping; thus, *Tinctura Kino* and *Tinctura Catechu* gelatinise when kept for a long time; *Tinctura Ferri Acetatis* also gelatinises on keeping, owing to the separation of the insoluble basic acetate, and *Tinctura Gallæ* when long kept becomes useless as a test for gelatine and the vegetable alkaloids, owing to the change of its tannic acid into gallic acid.

Tinctura Colchici is now made from the seeds, and is less liable to purge or nauseate than if made from the corm.

Tinctura Asafœtidæ is chiefly used in the form of enema. *Tinctura Digitalis*, if well made, has a greenish colour by transmitted light. *Tinctura Conii* is known to be good if the odour of conine is evolved on adding to it solution of potash.

Several of the tinctures have received popular names; thus, *Tinctura Aconitii* is sometimes called "Fleming's Tincture." It must be remembered, however, that Fleming's tincture is much stronger than the Pharmacopœial one. *Tinctura Benzoini Composita* is termed "Friar's Balsam;" while *Tinctura Camphoræ Composita* is known as "Paregoric Elixir;" while *Tinctura Opii Ammoniata* is sometimes called "Scotch Paregoric." *Tinctura Cinchonæ Composita* is occasionally sold as "Huxham's Tincture of Bark." It contains only half as much pale bark as the *Tinctura Cinchonæ Flavæ* does of yellow bark. *Tinctura Opii* is known as "Laudanum." And lastly, the *Tinctura Chloroformi et Morphinæ* is popularly known as "Chlorodyne."

The following are the preparations into the composition of which the tinctures enter:—

Tinctura Aurantii in Mistura Ferri Aromatica, Syrupus Aurantii, and Tinctura Quininæ.

Tinctura Cardamomi Composita in Decoctum Aloes Compositum, Mistura Ferri Aromatica, Mistura Sennæ Composita, and Tinctura Chloroformi Composita.

Tinctura Iodi in Vapor Iodi.

Tinctura Lavandulæ Composita in Liquor Arsenicalis.

Tinctura Opii in Enema and Linimentum Opii.

Tinctura Sennæ in Mistura Sennæ Composita.

Tinctura Toluiana in Trochisci Acidi Tannici, Trochisci Morphinæ, Trochisci Morphinæ et Ipecacuanhæ, and Trochisci Opii.

Tinctura Zingiberis Fortior in Acidum Sulphuricum Aromaticum, Pilula Scammonii Composita, and Syrupus Zingiberis.

TROCHISCI (LOZENGES).

This form of administration is adapted to such medicines as may be given in small doses, and which have not a disagreeable flavour.

There are twelve formulæ for them, viz. :—

Trochisci Acidi Benzoici.
,, Acidi Tannici.
,, Bismuthi.
,, Catechu.
,, Ferri Redacti.
,, Ipecacuanhæ.
,, Morphinæ.
,, Morphinæ et Ipecacuanhæ.
,, Opii.
,, Potassæ Chloratis.
,, Santonini.
,, Sodii Bicarbonatis.

The following table gives the composition and strength of each :—

Lozenge.	Each contains.	Active Ingredient.	Extra.	Refined Sugar.	Gum Acacia.	Mucilage of Gum Acacia	Distilled Water.
				ozs.	ozs.	ozs.	
T. ACIDI BENZOICI	½ gr. of Benzoic Acid	Benzoic Acid, 360 grs.	—	25	1	2	q.s.
T. CATECHU	1 gr. of Catechu	Pale Catechu, 720 grs.	—	25	1	2	q.s.

TROCHISCI (*continued*).

Lozenge.	Each contains.	Active Ingredient.	Extra.	Refined Sugar.	Gum Acacia.	Mucilage of Gum Acacia.	Distilled Water.
				ozs.	ozs.	ozs.	
T. FERRI REDACTI	1 gr. of Reduced Iron	Reduced Iron, 720 grs.	—	25	1	2	q.s.
T. IPECACUANHÆ	¼ gr. of Ipecacuanha	Ipecacuanha, 180 grs.	—	25	1	2	q.s.
T. POTASSÆ CHLORATIS	5 grs. of Chlorate of Potassium	Chlorate of Potassium, 3,600 grs.	—	25	1	2	q.s.
T. SODÆ BICARBONATIS	5 grs. of Bicarbonate of Sodium	Bicarbonate of Sodium, 3,600 grs.	—	25	1	2	q.s.
T. SANTONINI	1 gr. of Santonin	Santonin, 720 grs.	—	25	1	2	q.s.
T. ACIDI TANNICI	½ gr. of Tannic Acid	Tannic Acid, 360 grs.	Tinct. of Tolu, ½ oz.	25	1	2	1 oz.
T. MORPHINÆ	$\frac{1}{36}$ gr. of Hydrochlorate of Morphine	Hydrochlorate of Morphine, 20 grs.	Tinct. of Tolu, ⅓ oz.	24	1	2	½ oz.
T. MORPHINÆ ET IPECACUANHÆ	$\frac{1}{36}$ gr. of Hydrochlorate of Morphine, and $\frac{1}{12}$ gr. of Ipecacuanha	Hydrochlorate of Morphine, 20 gr.; Ipecacuanha, 60 grs.	Tinct. of Tolu, ½ oz.	24	1	2	½ oz.
T. OPII	$\frac{1}{10}$ gr. of Extract of Opium	Extract of Opium, 72 grs.	Tinct. of Tolu, ½ oz.; Extract of Liquorice, 6 ozs.	16	2	–	q.s.
T. BISMUTHI	2 grs. of Subnitrate of Bismuth	Subnitrate of Bismuth, 1,440 grs.	Carbonate of Magnesium, 4 ozs.; Precip. Carb. of Lime, 6 ozs.; Rose-water, q.s.	29	1	2	–

It will be noticed that the first seven of these lozenges have no extra ingredients, and, moreover, that the proportion of refined sugar, gum acacia, mucilage, and water, is the same in each case. It will also be presently shown that the directions for the preparation of each of these lozenges are the same. The next four lozenges in the table have half an ounce of tincture of tolu as an additional ingredient. Extract of liquorice is used in *Trochisci Opii* in lieu of the mucilage, and rose-water is substituted for distilled water in *Trochisci Bismuthi.*

The following direction for preparation applies to all the lozenges except *Trochisci Acidi Tannici*, *Morphinæ*, *Morphinæ et Ipecacuanhæ*, and *Opii*:—

"Mix the dry ingredients, and add the mucilage and water to form a proper mass. Divide into 720 lozenges, and dry them in a hot-air chamber with a moderate heat."

In the preparation of *Trochisci Acidi Tannici* and *Trochisci Morphinæ* the active ingredient is first dissolved in the water, the tincture of tolu and mucilage mixed are then added, and finally, the gum and sugar, also previously mixed. In *Trochisci Morphinæ et Ipecacuanhæ* the same process is performed, but the ipecacuanha is to be mixed with the gum and sugar. In *Trochisci Opii* the extract of opium is to be moistened with a little water, and added, with the tincture of tolu, to the extract of liquorice heated in a water-bath. When a proper consistence is obtained, the mixture is to be incorporated on a slab with the sugar and gum previously mixed.

UNGUENTA (OINTMENTS).

These may be generally defined as fatty substances adapted to inunction. In the older Pharmacopœias the so-called "cerates" formed a distinct class. Inasmuch as they differ from ointments merely in containing wax (cera), and, consequently, in having a firmer consistence, they are now very properly grouped with the latter preparations.

Many ointments become rancid on keeping—an effect retarded at least by the presence of benzoin. Geisler states that the addition of a few drops of nitric ether will remove the disagreeable fatty odour of ointments.

The great majority of the ointments are prepared by simple trituration of the ingredients, so as to ensure thorough mixture; but when wax, resins, paraffins, or concrete oils are to be mixed, the aid of gentle heat is necessary. In general terms the following may be said to be the process:—The wax or resins and unctuous matters are to be melted by a gentle heat; they are then removed from the fire, and, while cooling, well and constantly stirred, any dry substances to be added being meanwhile incorporated in a state of fine powder. Stress must be laid on the direction to employ *gentle heat:* too strong a temperature would cause the formation of acrid acids.

There are forty-three formulæ for ointments in the Pharmacopœia. The following classification, based on the nature of the unctuous ingredient, will be found to simplify the study of these preparations:—

CLASS I.

Ointment—the Basis of which is Prepared Lard.

Only one is now so prepared:—

Ointment.	Strength.	Ingredients.	Basis.
U. IODI	1 in 31	Iodine, 16 grs. Iodide of Potassium, 16 grs. Glycerine, ½ drm.	Prep. Lard.

This is prepared by rubbing the iodine and iodide of potassium together with the glycerine in a mortar, and gradually adding the lard.

Class II.

Ointments—the Basis of which is Benzoated Lard.

Ointment.	Strength.	Ingredients.	Basis.
U. Aconitinæ	1 in 60	Aconitinæ, 8 grs. Rectified Spirit, $\frac{1}{2}$ drm.	Benzoated Lard, 1 oz.
U. Atropinæ	1 in 60	Atropinæ, 8 grs. Rectified Spirit, $\frac{1}{2}$ drm.	
U. Belladonnæ	1 (of Ex.) in 10	Alcoholic Extract of Belladonna, 50 grs.	
U. Calaminæ	1 in 6	Prepared Calamine, 80 grs.	
U. Chrysarobini	1 in 25	Chrysarobin, 20 grs.	
U. Gallæ	1 in $6\frac{1}{2}$	Galls, 80 grs.	
U. Gallæ cum Opio	1 (of galls) in $6\frac{1}{2}$, and 1 of opium in 15	Galls, 80 grs. Opium, 32 grs.	
U. Hydrargyri Subchloridi	1 in $6\frac{1}{2}$	Subchloride of Mercury, 80 grs.	
U. Iodoformi	1 in 10	Iodoform, 48 grs.	
U. Plumbi Acetatis	1 in $37\frac{1}{2}$	Acetate of Lead, 12 grs.	
U. Potassii Iodidi	1 in $8\frac{3}{4}$ (nearly)	Iodide of Potassium, 64 grs. Carbonate of Potassium, 4 grs. Distilled Water, 1 drm.	
U. Staphisagriæ	1 in $2\frac{1}{4}$	Stavesacre Seeds, 160 grs.	
U. Sulphuris	1 in 5	Sublimed Sulphur, $\frac{1}{4}$ oz.	
U. Zinci	1 in $6\frac{1}{2}$	Oxide of Zinc, 80 grs.	

These are prepared by thoroughly mixing the ingredients by trituration. In the preparation of the first two the solid ingredients, before being incorporated with the lard, are to be well rubbed up with the spirit. In the preparation of *Unguentum Potassii Iodidi* the solid ingredients are dissolved in the water before being added to the lard. It would become yellow-coloured on keeping (owing to the liberation of iodine) if free alkali were not present. It is to prevent this that carbonate of potassium is employed. In preparing the *Unguentum Chrysarobini* the chrysarobin is dissolved in the melted lard by means of gentle heat and stirring. The *Unguentum Iodoformi* is prepared in the same manner. The *Unguentum Staphisagriæ* is prepared by macerating the crushed seeds in the lard, kept melted over a water-bath, for two hours. It is then strained through calico, and allowed to cool. In this way about 10 per cent. of the oil is contained in the ointment. In the preparation of *Unguentum Zinci* the lard is to be melted before adding to it the oxide of zinc, and the mixture is to be stirred while cooling.

In applying ointments of powerful alkaloids, as of aconitine, the precaution should always be taken of ascertaining that the skin is not abraded.

CLASS III.

Ointment—the Basis of which is Prepared Lard, and which also contains Prepared Suet.

Ointment.	Strength.	Ingredients.	Basis, etc.
U. HYDRARGYRI	1 in 2	Mercury, 1 lb.	Prep. Lard, 1 lb. Prep. Suet, 1 oz.

This ointment is prepared by rubbing the ingredients together until metallic globules cease to be visible. The extinction of the mercury is extremely difficult, and is now accomplished by machinery. If a portion of the ointment rubbed on paper shows metallic globules under a magnifier of four powers, it may be concluded that the mercury has not been sufficiently extinguished.

Whether mercury exists in this ointment merely in a state of mechanical division, or in a state of oxidation, is a debated point. The ointment, when first made, is bluish, hence its common name, "Blue Ointment;" but, on keeping, the colour becomes darker—a change attributable to oxidation. It is very generally believed that the oxide so formed enters into chemical combination with the lard, or one of its fatty acids; indeed, some pharmaceutists contend that the efficacy of the ointment depends upon the formation of this compound.

The use of the suet in *Unguentum Hydrargyri* is to prevent the separation of the metal in warm weather.

Class IV.

Ointment—the Basis of which is Prepared Lard, and which also contains Olive Oil.

Ointment.	Strength.	Active Ingredients.	Basis, etc.
U. Hydrargyri Nitratis	1 in 15½	Mercury, 4 ozs. Nitric Acid, 12 ozs.	Prep. Lard, 15 ozs. Olive Oil, 32 fluid ozs.

This (commonly known as "Citrine Ointment") is made as follows:—Dissolve the mercury in the nitric acid by a gentle heat; melt the lard in the oil by a water-bath in a large porcelain vessel; mix the two mixtures while hot, and if the mixture does not froth up, heat it until it does; finally, stir while cooling.

By the action of the nitric acid on the mercury, pernitrate of mercury is produced, thus:—

$$3Hg + 8HNO_3 = 3(Hg2NO_3) + 4H_2O + 2NO.$$

When the mercurial solution is mixed with the lard and oil, a reaction also occurs; the nature of this is complicated, and has not been hitherto explained.

CLASS V.

Ointments—the Basis of which is Lard, and which also contain Yellow Wax.

Ointment.	Strength.	Active Ingredients.	Basis, etc.
U. SABINÆ	1 in 2½ (nearly)	Fresh Savin Tops, 8 ozs.	Benzoated Lard, 16 ozs. Yellow Wax, 3 ozs.
U. TEREBINTHINÆ	1 (oil) in 2⅛	Oil of Turp., 1 oz. Resin, 54 grs.	Prep. Lard, ½ oz. Yellow Wax, ½ oz.

The first is made by melting the lard and wax together on a water-bath, adding the savin, digesting for twenty minutes, and finally straining through calico.

Unguentum Terebinthinæ is simply made by melting the ingredients over a water-bath, and stirring the mixture while cooling.

CLASS VI.

Ointments—the Basis of which is Simple Ointment.

Unguentum Simplex is made by melting together by means of a water-bath, and stirring while cooling, benzoated lard, 3 oz.; white wax, 2 oz.; and almond oil, 3 fluid oz.

Ointment.	Strength.	Active Ingredients.	Basis.
U. ANTIMONII TARTARATI	1 in 5	Tartarated Antimony, ¼ oz.	Simple Ointment, 1 oz.
U. CREASOTI	1 in 9	Creasote, 1 drm.	
U. ELEMI	1 in 5	Elemi, ¼ oz.	
U. HYDRARGYRI AMMONIATI	1 in 10	Ammoniated Mercury, 50 grs.	
U. HYDRARGYRI IODIDI RUBRI	1 in 28	Red Iodide of Mercury, 16 grs.	
U. PLUMBI CARBONATIS	1 in 8	Carbonate of Lead, 62 grs.	
U. PLUMBI IODIDI	1 in 8	Iodide of Lead, 62 grs.	

With the single exception of *Unguentum Elemi*, the simple direction for the preparation of the ointments of this class is to mix the ingredients thoroughly.

Unguentum Elemi is directed to be prepared by melting the ingredients, straining through flannel, and stirring constantly until the ointment solidifies.

Unguentum Plumbi Carbonatis was the old "Unguentum Cerussæ." *Unguentum Hydrargyri Ammoniati* is commonly known as "White Precipitate Ointment."

Class VII.

Ointments—the Basis of which is Soft and Hard Paraffin.

Ointment.	Strength.	Active Ingredients.	Basis.
U. Acidi Borici	1 in 7	Boric Acid, 70 grs.	Soft and Hard Paraffin, together, 1 oz.
U. Acidi Carbolici	1 in 19	Carbolic Acid, 25 grs.	
U. Acidi Salicylici	1 in 28	Salicylic Acid, 17 grs.	
U. Eucalypti	1 in 5	Oil of Eucalyptus, 96 grs.	
U. Hydrargyri Nitratis Dilutum	1 in 3	Ointment of Nitrate of Mercury, 160 grs.	
U. Glycerini Plumbi Subacetatis	1 in $6\frac{1}{3}$	Glycerine of Subacetate of Lead, 77 grs.	
U. Hydrargyri Oxidi Rubri	1 in 8	Red Oxide of Mercury, 60 grs.	
U. Potassæ Sulphuratæ	1 in $15\frac{1}{2}$	Sulphurated Potash, 30 grs.	
U. Sulphuris Iodidi	1 in $15\frac{1}{2}$	Iodide of Sulphur, 30 grs.	
U. Veratrinæ	1 in 63	Veratrine, 8 grs. (in 9 drms.) Olive Oil, 1 drm.	
U. Zinci Oleati*	1 in 2	Oleate of Zinc, 1 oz.	

Most of these ointments are prepared by adding the active ingredients to the melted mixture of the hard and soft paraffins, well mixing, and stirring constantly until cold. In the *Unguentum Hydrargyri Nitratis Dilutum*, the nitrate of mercury ointment is mixed with *Soft* paraffin (Vaseline) only, without the aid of heat. In the preparation of *Unguentum Veratrinæ* the veratrine is triturated with a drachm of olive oil before being added to the melted paraffins. Soft paraffin only is employed in the preparation of *Unguentum Zinci Oleati*

---

* Soft Paraffin only.

The Unguentum Potassæ Sulphurata should be freshly prepared.

CLASS VIII.

Ointments—the Basis of which is made up of Wax and Oil.

Ointment.	Strength.	Ingredients.	Wax.	Oil.
U. CANTHARIDIS	1 in 7 (about)	Cantharides, 1 oz.	Yellow, 1 oz.	Olive, 6 ozs.
U. HYDRARGYRI COMPOSITUM	1 in 4½	Oint. of Mercury, 6 ozs. Camphor, 1½ ozs.	Yellow, 3 ozs.	Olive, 3 ozs.
U. CETACEI	1 in 5	Spermaceti, 5 ozs. Benzoin, ½ oz.	White, 2 ozs.	Almond, 1 pint.

Unguentum Cantharidis is made by infusing the cantharides in the oil in a covered vessel for twelve hours, placing the vessel in boiling water for fifteen minutes, straining through muslin with strong pressure, adding the product to the wax previously melted, and stirring constantly while the mixture cools. Olive oil, being a good solvent of the active principle of cantharides, is now substituted for the boiling water of the older Pharmacopœias.

Unguentum Hydrargyri Compositum is made by melting the wax with a gentle heat, mixing the oil with it, and when the mixture is nearly cold, adding the other ingredients and mixing thoroughly. It is a substitute for "Scott's Ointment."

Unguentum Cetacei is simply prepared by mixing the ingredients by a gentle heat, straining and stirring while cooling.

UNCLASSED.

Unguentum Picis Liquidæ.—Tar, 5 oz.; yellow wax, 2 oz. Melt the wax with a gentle heat; add the tar, and stir while cooling.

Unguentum Resinæ.—Resin, in coarse powder, 8 oz.; yellow wax, 4 oz.; simple ointment, 16 oz.; almond oil, 2 fluid oz. Melt at low temperature, strain the mixture while hot through flannel, and stir till cold.

VAPORES (INHALATIONS).

There are five of these preparations now officinal. They should be so administered in a suitable apparatus as to enable the patient to breathe without effort the volatile ingredients evolved. They are as follows:—

Vapor Acidi Hydrocyanici.—Ten to fifteen minims of acid to 1 drachm of *cold* water.

Vapor Chlori.—Two oz. of chlorinated lime, and a sufficiency of cold water to moisten.

Vapor Coninæ.—Four drachms of juice of hemlock, 1 drachm of solution of potash, and 1 fluid oz. of distilled water. Twenty minims of the mixture are to be put on a sponge, and the vapour of hot water passing over it to be inhaled.

Vapor Creasoti.—Twelve minims of creasote and 8 oz. of *boiling* water. Cause air to be passed through the mixture and inhale it.

Vapor Iodi.—One drachm of tincture of iodine and 1 oz. of water. Apply a gentle heat, and inhale the vapour.

Vapor Olei Pini Sylvestris.—Forty minims of Fir-wood Oil, 20 grains of light carbonate of magnesium. The oil is to be rubbed with the carbonate of magnesium, and sufficient water added to make 1 fluid oz. One drachm of this mixture is put with ½ pint of cold and ½ pint of boiling water, in an apparatus so arranged that air may be made to pass through the solution and may afterwards be inhaled.

The addition of the alkali in *Vapor Coninæ* at once develops the characteristic odour of the hemlock.

VINA (WINES).

Wine, in consequence of the alcohol contained, and in some instances owing to the acidity, is a solvent of many substances insoluble in water. Wines, however, are sometimes objectionable, both for their liability to undergo decomposition, and owing to the fact that the proportion of alcohol present is by no means always constant.

Including Vinum Aurantii and Vinum Xericum there are eleven medicinal wines in the Pharmacopœia, viz. :—

Vinum Aloes, 1 in 26½.
,, Antimoniale, 1 in 240, or 2 grains to 1 oz.
,, Aurantii (Orange Wine).
,, Colchici, 1 in 5.
,, Ferri.
,, Ferri Citratis, 1 in 60, or 8 grains to 1 oz.
,, Ipecacuanhæ, 1 in 20, or 22 grains to 1 oz.
,, Opii, 1 (*Extract*) in 20.
,, Quininæ, 1 in 480, or 1 grain to 1 oz.
,, Rhei, 1 in 15½, or 33 grains to 1 oz.
,, Xericum (Sherry).

Orange Wine forms the basis of Vinum Ferri Citratis and of Vinum Quininæ, Sherry that of all the other wines.

The following are the ingredients of the wines :—

Vinum Aloes.

Socotrine Aloes - - - -	1½ oz.
Cardamom Seeds - - - -	80 grs.
Ginger, *coarsely powdered* - - -	80 grs.
Sherry - - - - -	2 pints

Vinum Antimoniale.

Tartarated Antimony	40 grs.
Sherry	1 pint

Vinum Colchici.

Colchicum Corm, *sliced, dried and powdered*	4 oz.
Sherry	1 pint

Vinum Ferri.

Fine Iron Wire	1 oz.
Sherry	1 pint

Vinum Ferri Citratis.

Citrate of Iron and Ammonia	160 grs.
Orange Wine	1 pint

Vinum Ipecacuanhæ.

Ipecacuanha, *coarsely powdered*	1 oz.
Acetic Acid	1 oz.
Distilled Water	q.s.
Sherry	1 pint

Vinum Opii.

Extract of Opium	1 oz.
Cinnamon Bark, *bruised*	75 grs.
Cloves, *bruised*	75 grs.
Sherry	1 pint

Vinum Quininæ.

Sulphate of Quinine	20 grs.
Citric Acid	30 grs.
Orange Wine	1 pint

Vinum Rhei.

Rhubarb Root, *coarse powder*	1½ oz.
Canella Bark, *coarse powder*	60 grs.
Sherry	1 pint

It will be seen, on reference to the above, that all the wines may be said to be simple except *Vinum Aloes*, *Vinum Opii*, and *Vinum Rhei.*

All the wines are made by maceration (pressing and straining when necessary) and subsequent filtration, except *Vinum Antimoniale*, *Vinum Ferri Citratis*, and *Vinum Quininæ*, which are made by simple solution and subsequent filtration.

Vinum Ipecacuanhæ.—This is now directed to be prepared by macerating the coarsely powdered ipecacuanhæ in 1 oz. of acetic acid for twenty-four hours. This is then transferred to a percolator, and sufficient distilled water passed to produce 1 pint. Evaporate the product to dryness over a water-bath, powder the residue and macerate it in the sherry for forty-eight hours with occasional agitation, and filter.

Vinum Xericum contains from 17 to 18 per cent. of alcohol, with colouring matter, œnanthic ether, bitartrate of potassium, malates and sugar, etc.

Vinum Aurantii is made by fermenting a saccharine solution to which the fresh peel of bitter orange has been added. It contains about 12 per cent. of alcohol, and is slightly acid.

In *Vinum Antimoniale*, if the tartarated antimony is impure, or the wine of inferior quality, perfect solution is often impossible, and the salt is frequently decomposed. The wine often contains matters which cause precipitation of the *oxide* of antimony.

Vinum Ferri very probably contains *tartrate of potassium and iron*, formed by the action on the iron of the bitartrate of potassium contained in the sherry.

Vinum Ipecacuanhæ, when long kept, not unfrequently throws down a precipitate of a mixture of bitartrate of potassium and cephaelate of emetina.

Vinum Quininæ is a solution of neutral and citrate of quinine in orange wine; the citric acid aids materially in the solution of the disulphate.

UNCLASSED PREPARATIONS.

Name.	B. P. Preps.	Dose.	Action and Uses.
ÆTHER	Æther purus	20 to 60 mins.	Internally, ether is a powerful diffusible stimulant. It is used to allay spasm in asthma, angina pectoris, and hysteria. When inhaled it produces anæsthesia without the depressing effect of chloroform on the heart. As a spray it is employed to induce local anæsthesia by cold.
	Collodium	—	
	Collodium Flexile	—	
	Spiritus Ætheris	30 to 90 mins.	
	Spiritus Ætheris Compositus	$\frac{1}{2}$ to 2 drms.	
	Tinctura Chloroformi et Morphinæ	5 to 10 mins.	
ÆTHER ACETICUS	—	20 to 60 mins.	It possesses the stimulant and anti-spasmodic properties of ether, but to a less degree.
	Liquor Epispasticus	—	
AMYL NITRIS (Nitrite of Amyl)	—	2 to 5 mins. (inhaled) $\frac{1}{2}$ to 1 min.	Produces rapid dilatation of systemic and pulmonary arterioles, with lowered blood-pressure and quickened cardiac action. It is used to cut short the attacks of angina pectoris, and in cases of chloroform poisoning.
NITROGLYCERINUM (not official) Glonoine	Tabellæ Nitroglycerini $\frac{1}{100}$ gr. each	1 to 2 tablets.	Its action is similar to that of amyl nitrite, but is more persistent. It is used in angina pectoris, headache, neuralgia, etc.

Name.	B. P. Preps.	Dose.	Action and Uses.
Butyl Chloral Hydras (Croton Chloral ?)	—	1 to 15 grs.	In small doses to relieve pain, in larger doses to procure sleep. Is said specially to affect the fifth nerve.
Chloral Hydras (Hydrate of Chloral)	—	5 to 30 grs.	Is used to procure sleep, particularly when sleeplessness is not consequent on pain. Also to relieve spasm. It is employed in the treatment of delirium tremens and allied conditions, and to facilitate dilatation of the *os uteri* in labour.
	Syrupus Chloral (10 grs. to 1 drm.)	½ to 2 drms.	
Chloroformum	—	1 to 10 mins.	Internally it acts as a narcotic and antispasmodic. Inhaled it is used to produce anæsthesia for surgical purposes and during parturition. Externally to allay pain and irritation.
	Aqua Chloroformi	½ to 2 fl. ozs.	
	Linimentum Chloroformi	—	
	Spiritus Chloroformi	½ to 1 drm.	
	Tinctura Chloroformi Comp.	½ to 1 drm.	
	Tinctura Chloroformi et Morphinæ	5 to 10 mins.	
Iodoformum	—	½ to 3 grs.	Is a powerful antiseptic and deodoriser—in strong solution is a local anæsthetic. Is used to dress foul-smelling ulcers, chancres, etc.
	Suppositoria Iodoformi	—	
	Unguentum Iodoformi	—	
Pyroxylin (Gun Cotton)	Collodium	—	Is useful as a protective to inflamed or abraded surfaces.
	Collodium Flexile	—	
	Collodium Vesicans	—	

Name.	B. P. Preps.	Dose.	Action and Use.
CEREVISIÆ FERMENTUM (Yeast)	Cataplasma Cerevisiæ	½ to 1 oz.	Internally, to prevent the formation of boils and carbuncles; externally, as a stimulant and antiseptic.

Pyroxylin.

"Gun cotton," prepared by immersing 1 oz. of cotton in a mixture of 5 oz. each of sulphuric and nitric acids, for three minutes, then washing out the acids well with water, until the washings cease to give a precipitate with chloride of barium, and finally draining on filtering paper, and drying in a water-bath.

It is readily soluble in a mixture of ether and rectified spirit, forming collodion, for the preparation of which it was introduced into the Pharmacopœia. When exploded by heat it leaves no residue.

Collodium.

Collodion, as above stated, is a solution of 1 oz. of pyroxylin in a mixture of 36 oz. of ether and 12 oz. of rectified spirit.

It is a colourless liquid with an ethereal odour; highly inflammable, and dries rapidly on exposure to the air, forming a transparent film which is insoluble in water or rectified spirit.

Collodium Flexile.

Is a mixture of 6 oz. of collodion, 120 grains of Canada balsam, and 1 drachm of castor oil.

Collodium Vesicans.

Is prepared by dissolving 1 oz. of pyroxylin in 20 fluid oz. of Liquor Epispasticus.

Æther.

"Sulphuric ether of Edin. and Dub." is the oxide of ethyl. It contains not less than 92 per cent. by volume of pure ether $(C_2H_5)_2O$.

It is unnecessary to detail the complicated process for preparing ether as given in the Pharmacopœia. Suffice it to say, in general terms, that it is made by the action of 10 oz. of sulphuric acid on 50 oz. of rectified spirit, added in successive portions. It is purified from any sulphurous or sulphuric acid and water by allowing it to stand on chloride of calcium and slaked lime, and redistilling to the sp. gr. of 0·735.

The following is a brief explanation of the process:—By the reaction of sulphuric acid on rectified spirit, *Sulphovinic acid* $(C_2H_6SO_4)$ is first formed, thus:—

$$H_2SO_4 + C_2H_6O = C_2H_6SO_4 + H_2O.$$

By the reaction now of alcohol on the sulphovinic acid, the latter is decomposed, forming sulphuric acid and ether, thus:—

$$C_2H_6SO_4 + C_2H_6O = H_2SO_4 + (C_2H_5)_2O.$$

By the addition of more alcohol sulphovinic acid is again formed; and thus, by the continuous supply of alcohol, the production of ether becomes continuous—sulphovinic acid being an intermediate product.

It is a colourless, volatile, inflammable liquid, with a characteristic odour; boils below 105°. Fifty measures agitated with an equal volume of water are reduced to 45 by an absorption of 10 per cent. It leaves no residue on evaporation.

It enters into the preparation of *Æther Purus, Collodium, Collodium Flexile, Spiritus Ætheris, Spiritus Ætheris Compositus and Tinctura Chloroformi et Morphinæ.*

Æther Purus.

Ether free from either alcohol or water. The process of purification is effected as follows:—Wash the ether well with water (by which the spirit is removed), and when the liquids have been separated, after a couple of minutes, decant the supernatant ether; digest the latter then for twenty-four hours with recently burned lime and chloride of calcium (to remove the water), and finally distil with the aid of a gentle heat. Its sp. gr. should not exceed 0·720, and it should not coagulate the albumen of the blood; if alcohol were present, the sp. gr. would be exceeded, and it *would* coagulate the albumen of the blood.

Water and sulphurous acids are occasional impurities, the former increasing its sp. gr., the latter imparting to it an acid reaction.

Æther Aceticus.

Acetic ether, or acetate of ethyl ($C_2H_5C_2H_3O_2$), may be obtained by distilling a mixture of 40 oz. of dry acetate of sodium, 32¼ oz. of rectified spirit, and 32½ oz. of sulphuric acid; adding the distilled product to 6 oz. of freshly dried carbonate of potassium in a stoppered bottle; letting them remain together for twenty-four hours, and then decanting and rectifying the ethereal liquid.

In this process the sulphuric acid converts the alcohol into the ether, and liberates acetic acid from the acetate of sodium; the ether and the acetic acid combine to form acetic ether, which distils with some water; the latter is removed by the carbonate of potassium. Two stages occur in the reaction :—

1. $H_2SO_4 + C_2H_6O = C_2H_6SO_4 + H_2O$.
2. $C_2H_6SO_4 + NaC_2H_3O_2 = C_2H_5C_2H_3O_2 + NaHSO_4$.

Acetic ether is a colourless liquid, with an agreeable ethereal odour; sp. gr., 0·900; boiling-point, 166°. Soluble in all proportions in rectified spirit and in ether; 1 part dissolves in 11 or 12 parts of water at 60°. It is a good solvent of essential oils, resins, etc. By alkalies it is decomposed into alcohol and alkaline acetates.

It is used in the preparation of *Liquor Epispasticus.*

Amyl Nitris.

Nitrite of Amyl ($C_5H_{11}NO_2$) is produced by the action of nitric or nitrous acid on amylic alcohol. To purified amylic alcohol, in a glass retort containing some copper foil, add one-tenth of its bulk of sulphuric acid ; add the same quantity of nitric acid diluted with an equal volume of water ; apply a gentle heat, and add more nitric acid gradually until nearly all the amylic alcohol is exhausted ; wash the distilled product with solution of soda, to remove hydrocyanic acid, etc., and rectify it over fused caustic potash, to remove any moisture. The following is the reaction :—

$$C_5H_{12}O + Cu + H_2SO_4 + HNO_3 = C_5H_{11}NO_2 + CuSO_4 + 2H_2O.$$

Another way is to act upon arsenious acid (As_2O_3) with nitric acid, the resulting nitrous anhydride (N_2O_3) being conducted into the amylic alcohol :—

$$2HNO_3 + As_2O_3 = N_2O_3 + H_2O + As_2O_5.$$
$$N_2O_3 + 2C_5H_{12}O = 2C_5H_{11}NO_2 + H_2O.$$

It is the homologue of nitrite of ethyl (Sp. Æther. Nitr.), and is an ethereal liquid of a yellowish colour and peculiar, not disagreeable, odour ; sp. gr., 0·880 ; boiling point, 205° ; insoluble in water ; soluble in rectified spirit in all proportions. If it be added, drop by drop, to caustic potash, while fused by the application of heat, valerianate of potassium will be formed. It volatilises at 262° to 270° F.

Nitro-Glycerinum ($C_3H_5\ (NO_3)_3$).

Nitro-glycerine is prepared by dropping glycerine into a mixture of nitric and sulphuric acids kept cold by ice. It is a colourless transparent fluid, with sweet aromatic taste, but without odour. Sparingly soluble in water ; freely so in absolute alcohol and ether. It is very explosive, but is safe in fatty or oily solution. It may be kept in a 1 per cent. aqueous or alcoholic solution.

Butyl-Chloral Hydras.

Butyl-chloral is produced by the action of dry chlorine gas on aldehyd, cooled to a temperature of 14° F., separated by fractional distillation, and converted into the solid hydrous butyl-chloral by the addition of water. It occurs in pearly-white crystalline scales, with a pungent odour not unlike that of chloral hydrate, and an acrid nauseous taste. It fuses at about 172° F. to a transparent liquid, which begins to solidify when cooled to about 160°. It is soluble in about 50 parts of water, in its own weight of glycerine and rectified spirit, and nearly insoluble in chloroform. The aqueous solution is neutral or faintly acid. It does not yield chloroform when heated with alkalies.

This substance was formerly (but erroneously) known as "Croton-Chloral Hydrate."

Chloral Hydras.

Hydrate of chloral (C_2HCl_3O,H_2O) is produced by the prolonged action of dry chlorine gas on anhydrous alcohol; the gas being passed through the alcohol for several days, so long as it is absorbed. The resulting liquid is purified by treatment—first with sulphuric acid, which retains water and any unchanged alcohol, and afterwards with a small quantity of lime, which fixes the free hydrochloric acid that is produced. It is finally converted into the solid hydrate by the addition of water. The reactions which take place are complicated; but result primarily in the formation of aldehyd (C_2H_4O) and hydrochloric acid; mono- and subsequently tetra-chlorinated ether, or chloral, being finally obtained. And—

$$2(C_2HCl_3O,H_2O) + Ca2HO = 2CHCl_3 + Ca2CHO_2 + 2HO.$$

The latter reaction is utilised in ascertaining the amount of chloroform yielded by acting on a definite quantity of chloral with slaked lime. Thus the value of a specimen may be calculated from the molecular weights. The molecular weight of chloral=165·5, which multiplied by 2 =331; the molecular weight of chloroform = 119·5, multiplied by 2 = 239. Therefore, as 331 grains of chloral are equivalent to 239 grains of chloroform, 100 grains of chloral will equal 72·2 grains of chloroform—331 : 100 :: 239 : 72·2.

Chloral hydrate occurs in colourless crystals, which do not deliquesce on exposure to air. It has a pungent but not an acrid odour, and a pungent and rather bitter taste. On the application of a gentle heat it fuses to a colourless transparent liquid, which, as it cools, begins to solidify at a temperature of about 120°. It boils in a test-tube, with pieces of broken glass immersed in it, at about 205°, and at a slightly higher temperature it volatilises on platinum foil without residue. Soluble in less than its own weight of distilled water, rectified spirit, or ether, and in four times its weight of chloroform. The aqueous solution is neutral or but slightly acid to test-paper. A solution in chloroform, when mixed by agitation with sulphuric acid, does not impart colour to the acid, showing freedom from chlorinated organic impurities (alcoholate of chloral). It is decomposed by alkalies into chloroform and an alkaline formate :—

$$C_2HCl_3O,H_2O + KHO = KCHO_2 + H_2O + CHCl_3.$$

100 grains of hydrate of chloral dissolved in 1 oz. of distilled water, and mixed with 30 grains of slaked lime, submitted to careful distillation with a suitable apparatus, should yield not less than 70 grains of chloroform. It enters into the preparation of the *Syrupus Chloral* (p. 386).

Chloroformum.

Terchloride of Formyl, or Trichloromethane ($CHCl_3$).

The following is an abstract of the Pharmacopœial method of preparing chloroform :—3 gallons of water and 30 oz. of rectified spirit are distilled with a mixture of 10 lb. of chlorinated lime and 5 lb. of slaked time; the first 50 oz. of the distillate is well washed with water, and after the mixture separates into two strata, the lower one, which is crude chloroform, is removed, washed repeatedly with successive portions of distilled water, and then shaken with its own volume of sulphuric acid. When the mixture settles, the chloroform is again separated, mixed with 2 oz. of chloride of calcium and $\frac{1}{2}$ oz. of slaked lime, and again distilled over a water-bath.

The following reactions indicate the probable steps in the process :—

$$\text{1st.}\quad \underbrace{2C_2H_6O}_{\text{Alcohol.}} + \underbrace{O_2}_{\text{Oxygen.}} = \underbrace{2C_2H_4O}_{\text{Aldehyd.}} + \underbrace{2H_2O}_{\text{Water.}}$$

$$\text{2nd.}\quad \underbrace{C_2H_4O}_{\text{Aldehyd.}} + \underbrace{3Cl_2}_{\text{Chlorine.}} = \underbrace{C_2HCl_3O}_{\text{Chloral.}} + \underbrace{3HCl}_{\substack{\text{Hydrochloric}\\ \text{Acid.}}}$$

$$\text{3rd.}\quad \underbrace{2C_2HCl_3O}_{\text{Chloral.}} + \underbrace{Ca2HO}_{\substack{\text{Hydrate of}\\ \text{Calcium.}}} = \underbrace{Ca2CHO_2}_{\substack{\text{Formate of}\\ \text{Calcium.}}} + \underbrace{2CHCl_3}_{\text{Chloroform.}}$$

The process as a whole may be thus expressed :—

$$\underbrace{4C_2H_6O}_{\text{Alcohol.}} + \underbrace{8CaCl_2O_2}_{\substack{\text{Hypochlorite}\\ \text{of Calcium.}}} = \underbrace{2CHCl_3}_{\text{Chloroform.}} + \underbrace{3(Ca2CHO_2)}_{\substack{\text{Formate of}\\ \text{Calcium.}}} + \underbrace{5CaCl_2}_{\substack{\text{Chloride of}\\ \text{Calcium.}}} + \underbrace{8H_2O}_{\text{Water.}}$$

Chloroform is a colourless liquid with a peculiar ethereal odour and sweet taste. Its sp. gr. is 1·497. It is slightly soluble in water, but soluble in all proportions of alcohol and ether. It is neutral in reaction, should not be coloured by sulphuric acid, and should leave no residue or unpleasant odour after evaporation. It is decomposed by fixed alkalies, and, on exposure to air and light, is apt to be decomposed into hydrochloric acid and chlorine. It is a powerful solvent of caoutchouc, gutta-percha, resins, many fats and vegetable alkaloids.

The following are its Pharmacopœial preparations :—*Aqua Chloroformi*, *Linimentum Chloroformi*, *Spiritus Chloroformi*, *Tinctura Chloroformi Composita,* and *Tinctura Chloroformi et Morphinæ.*

Iodoformum.

Teriodide of Formyl, or Tri-iodomethane (CHI_3).

Is produced by the action of iodine on a mixture of alcohol and solution of carbonate of potassium. It occurs in glistening, lemon-yellow, crystalline scales, somewhat greasy to the touch, and having a peculiar and persistent odour. Very slightly soluble in cold water, more so in rectified spirit, soluble in chloroform and ether, and readily in the latter when warm. Warmed with an alcoholic solution of potash and the resulting fluid acidified by nitric acid, iodine is liberated, the mixture turning brown, or, when cold, blue on the addition of a little mucilage of starch.

Iodoform is contained in *Suppositoria Iodoformi* (p. 384) and in the *Unguentum Iodoformi* (p. 402).

Cerevisiæ Fermentum.

Beer Yeast, the ferment obtained in brewing beer, is a viscid, semifluid, frothy substance. It is essentially composed of a fungus—the Saccharomyces cerevisiæ—exhibiting under the microscope numerous round or oval confervoid cells. It is used in the preparation of the *Cataplasma Fermenti* (p. 316).

ABSTRACT OF THE PROCESSES DIRECTED FOR THE PREPARATION OF THE ALKALOIDS, ETC.

Aconitina.

1. Digest the root coarsely powdered with rectified spirit to exhaust it of the aconitate of aconitine and resinous matter, and then recover the spirit by distillation and evaporation.

2. Dissolve the alkaloidal salt in water, by which means it is separated from the resinous matter.

3. Add ammonia to the aqueous solution of the aconitate

of aconitine; aconitine and some colouring matter are thus precipitated, while aconitate of ammonium is formed and remains in solution.

4. Dissolve the precipitated aconitine by ether, which is afterwards recovered by distillation.

5. Add sulphuric acid to form sulphate of aconitine, and decompose this subsequently by solution of ammonia; aconitine is thus precipitated, while sulphate of ammonium remains in solution.

6. Wash the aconitine so obtained with cold water, and, finally, dry between the folds of blotting-paper.

Aloin.

This crystalline substance is obtained from aloes by solvents and subsequent purification and recrystallization.

Apomorphinæ Hydrochloras.

Is obtained by heating hydrochlorate of morphine to 300° F., in sealed tubes, with excess of hydrochloric acid.

Dilute the contents of the tube with water, precipitate with bicarbonate of sodium, and treat the precipitate with ether or chloroform.

Shake the solution in ether or chloroform with a very small quantity of strong hydrochloric acid.

Dissolve in hot water and recrystallise.

Atropina.

1. Digest the root with rectified spirit to exhaust it of the malate of atropine.

2. By the addition of lime, malate of lime is formed and atropine set free.

3. Add sulphuric acid to form sulphate of atropine.

4. Separate any resinous matter which may be present by the addition of carbonate of potassium in quantity sufficient to produce neutralisation; remove the resinous matter so precipitated by filtration.

5. Again add carbonate of potassium, but in sufficient

quantity to produce alkalinity; sulphate of potassium is thus formed, and atropine is set free and removed by chloroform.

6. Distil off the chloroform, and purify the atropine by solution in spirit, digestion with animal charcoal, filtration, and evaporation.

Atropinæ Sulphas.

Prepared by the action of sulphuric acid on atropine.

Beberinæ Sulphas.

1. Exhaust the bark by sulphuric acid.

2. Concentrate the liquor, and add sufficient lime to precipitate the colouring and vegetable matter, which remove by filtration.

3. Add solution of ammonia to the filtrate, by which means sulphate of ammonium is formed and the beberine is precipitated.

4. Dissolve out the beberine by spirit, which is to be recovered by distillation.

5. Again add sulphuric acid to form sulphate of beberine.

6. The sulphate of beberine so obtained is evaporated to dryness, powdered, and dissolved in water. The aqueous solution is reduced to a syrupy consistence by evaporation, and finally dried in thin layers on glass plates.

Caffeinæ.

This alkaloid is usually obtained from the dried leaves by evaporating aqueous infusions from which astringent and colouring matters have been removed.

Caffeinæ Citras.

Is prepared by dissolving caffeine in a heated solution of citric acid and evaporating to dryness.

Cinchonidinæ Sulphas.

Is obtained from the mother-liquors of the crystallisation of sulphate of quinine by further concentration and purification by crystallisation from alcohol, and finally from hot water.

Cinchoninæ Sulphas.

It may be obtained from the mother-liquors of the crystallisation of the sulphates of quinine, cinchonidine and quinidine, by precipitating the alkaloid with caustic soda.

Wash with spirit to free from other alkaloids, and dissolve in sulphuric acid.

Purify with animal charcoal and crystallise.

Cocainæ Hydrochloras.

It may be obtained by agitating with ether an aqueous solution of an acidulated alcoholic extract made alkaline with carbonate of sodium.

Separate and evaporate the ethereal solution, purifying the product by repeating the treatment with acidulated water, carbonate of sodium and ether.

Decolourise, neutralise with hydrochloric acid, and recrystallise.

Codeina.

This alkaloid of opium is prepared by evaporating the ammoniacal liquors from which morphine has been obtained, treating the residue with water, precipitating with caustic potash, and purifying by recrystallisation from ether.

Elaterinum.

1. Exhaust elaterium with chloroform.
2. Add ether to chloroformic solution.
3. Collect precipitate and wash with ether.
4. Purify by recrystallisation from chloroform.

Ergotinum.

This is, in reality, only a purified extract.

1. Evaporate the fluid extract to a syrup, and when cold mix with spirit.

2. Let it stand for half an hour, then filter and evaporate to the consistence of a soft extract.

Morphinæ Hydrochloras.

1. Digest opium in water, which dissolves out the meconate and sulphate of morphine and some codeine.

2. Add chloride of calcium, to form meconate and sulphate of lime, which are precipitated, and hydrochlorate of morphine, which is held in solution.

3. Evaporate, to form a solid mass, and then dissolve out the hydrochlorate of morphine with water. Repeat this process several times, using powerful pressure each time to get rid of the colouring matter, and decolourising also with animal charcoal.

4. Add ammonia, by which means morphine is precipitated and separated from any codeine which may be present.

5. Treat the morphine with hydrochloric acid to form hydrochlorate of morphine, which is allowed to crystallise out.

Morphinæ Acetas.

1. Decompose hydrochlorate of morphine by ammonia.

2. Treat the morphine so precipitated with acetic acid to form acetate of morphine, which is obtained as a dry powder by evaporation and drying with a gentle heat.

Morphinæ Sulphas.

Add diluted sulphuric acid to morphine dissolved in twice its weight of boiling distilled water.

Morphinæ Bimeconas.

This alkaloidal salt is prepared by precipitating morphine from a solution of hydrochlorate of morphine by adding solution of ammonia.

Wash the precipitate until all the ammonia has been removed, mix with the water, and then add rectified spirit and meconic acid to form solution.

Physostigmina.

1. Dissolve the alcoholic extract of calabar bean in water.

2. Add bicarbonate of sodium.

3. Shake the mixture with ether and evaporate the ethereal solution.

Pilocarpinæ Nitras.

1. Shake the extract of jaborandi in a bottle with chloroform and an alkali.

2. Evaporate the chloroformic solution.

3. Neutralise the product with nitric acid and purify by recrystallisation.

Quininæ Hydrochloras.

Is obtained in the same way as the sulphate (*quod vide*), the separated alkaloid being neutralised by hydrochloric acid.

Quininæ Sulphas.

1. Exhaust the bark of its alkaloids by hydrochloric acid.

2. Precipitate the alkaloids by adding soda, chloride of sodium being formed and remaining in solution.

3. Add sulphuric acid to the precipitate to form sulphate of quinine and of cinchonine.

4. Set aside to crystallise. The sulphate of quinine separates first.

Santoninum.

1. Boil bruised santonica with lime and water to form santonate of lime.

2. Precipitate the santoninum by the action of hydrochloric acid; chloride of lime is thus formed, and is held in solution.

3. Skim off the oily matter and decant the fluid from the precipitate.

4. Wash the precipitate with water and with ammonia to free it from acid.

5. Decolorise by animal charcoal, and then dissolve out the santonin by boiling spirit.

6. Set aside to crystallise in the dark and preserve in

bottles protected from the light, lest the crystals should become yellow-coloured.

Strychnina.

1. Exhaust the seeds, by digestion in alcohol and water, of the igasurates of strychnine and brucine.
2. Add acetate of lead to form acetates of strychnine and brucine, igasurate of lead being precipitated.
3. Add ammonia to precipitate the alkaloids, acetate of ammonium being formed and held in solution.
4. Dissolve the precipitated alkaloids in spirit, and evaporate the spirituous solution to deposit the strychnine, which separates first, brucine remaining in solution.
5. Wash the strychnine thus obtained until the washings no longer become red with nitric acid, showing the absence of brucine.
6. Dissolve finally in boiling water and crystallise.

Veratrina.

1. Exhaust the ground seeds (separated from the capsules by a preliminary process) with rectified spirit to dissolve out the veratrine together with gallic acid and resinous matter.
2. Concentrate the solution and pour it into water to precipitate the resin, which is removed by filtration.
3. Add ammonia, by which means the impure veratrine is precipitated, while the gallic acid unites with the ammonia.
4. Wash the precipitated veratrine with water on a filter, add hydrochloric acid to it to form hydrochlorate of veratrine, and decolorise this with animal charcoal.
5. Add ammonia again, by which means the hydrochlorate of veratrine is decomposed, the veratrine is precipitated, and hydrochlorate of ammonium formed and held in solution.
6. The precipitated veratrine is washed until the washings cease to give a white precipitate on adding nitrate of silver acidulated with nitric acid, showing perfect freedom from hydrochlorate of ammonium.

APPENDIX TO THE PHARMACOPŒIA.

The British Pharmacopœia has an appendix, the contents of which are arranged under three heads as follows :—

I.—Articles Employed in Chemical Testing.
II.—Test Solutions.
III.—Test Solutions for Volumetric Analysis.

I.

ARTICLES EMPLOYED IN CHEMICAL TESTING.

The majority of these articles and their uses having been already referred to, it will suffice to give a nominal list. Most of them are employed for making the "Test Solutions." (See next page.)

Alcohol (C_2H_6O), p. 378.
Acetate of Sodium ($NaC_2H_3O_2,3H_2O$).
Benzol, or Benzene (C_6H_6), prepared from coal-tar oil. Test for purity of copaiba.
Benzolated Amylic Alcohol. Used to estimate the amount of total alkaloids in cinchona bark.
Boracic Acid (H_3BO_3), p. 20, 24.
Chloride of Barium ($BaCl_2$).
Copper Foil (Cu). Test for nitric acid, p. 31. Used in Reinsch's test for arsenic, p. 23.
Ferricyanide of Potassium.
Gold (Au).
Hyposulphite of Sodium ($Na_2S_2H_2O_4$), pp. 124, 131.
Indigo (C_8H_5NO), p. 196.
Isinglass, p. 302.
Litmus, p. 292.

Oxalic Acid ($H_2C_2O_4$).

Oxalate of Ammonium, $(NH_4)_2C_2O_4$.

Petroleum Spirit (Benzoline). Employed as a test for copaiba.

Phenol-Phthalein.

Plaster of Paris ($CaSO_4$), p. 63.

Platinum Black (Pt). Test for fusel oil, p. 378.

Platinum Foil.

Subacetate of Copper of commerce, Verdigris ($Cu2C_2H_3O_2$, CuO).

Sulphate of Copper, Anhydrous. Test for freedom of alcohol from water, p. 378.

Sulphide of Iron (FeS).

Sulphuretted Hydrogen (H_2S).

Tin, Granulated (Sn).

Turmeric.

II.

TEST SOLUTIONS.

The following six are made by dissolving ½ oz. of the salt in 5 oz. of water.

SOLUTION OF	USES.
Acetate of Potassium - - -	To distinguish between Tartaric and Citric Acids. It gives a precipitate of Bitartrate of Potassium with the former.
Acetate of Sodium - - -	To indicate the constituents of Phosphate of Calcium (p. 63).
Chloride of Ammonium - -	Test for Magnesium. The solution with some free ammonia is added to the substance to be tested; phosphate of sodium is then added, and the magnesium is precipitated as Ammonio-Magnesian Phosphate.
Chloride of Barium - - -	Test for Sulphuric Acid and Sulphates.

SOLUTION OF	USES.
Iodide of Potassium	Test for Lead. Yellow iodide of lead is formed.
Phosphate of Sodium	In testing for Magnesium (*v. supra*, Chloride of Ammonium).

The following three solutions are made by dissolving ½ oz. of the salt in 10 oz. of water :—

SOLUTION OF	USES.
Carbonate of Ammonium	To distinguish zinc from alumina and the alkaline earths. It gives with zinc salts a white precipitate soluble in excess.
Ferricyanide of Potassium	To distinguish proto- from per-salts of iron. It gives a blue precipitate with a protoxide of iron ; no precipitate with a peroxide.
Ferrocyanide of Potassium	Test for many metals. It gives a *blue* precipitate with per-salts of iron, *reddish-brown* with copper, and *white* with proto-salts of iron, and salts of manganese, zinc, tin, cadmium, lead, bismuth, antimony, mercury, and silver.

No general rule can be given for the preparation of the remaining test solutions.

SOLUTION OF	USES.
Oxalate of Ammonium Dissolve ½ oz. of oxalate of ammonium in 20 oz. of water.	Test for Lime.
Chloride of Calcium (*Saturated*) Dissolve 336 grains in 1 oz. of water.	Test for the purity of Spiritus Ætheris Nitrosi.
Sulphate of Iron Dissolve 10 grains of the granulated sulphate in 1 oz. of boiling water.	Test for Nitric Acid, which changes it to a deep olive-green colour.

SOLUTION OF	USES.
Acetate of Copper Digest ½ oz. of subacetate of copper in a mixture of 1 oz. of acetic acid and ½ oz. of water at a temperature not above 212°, stirring until a dry residue is obtained. Dissolve this in sufficient water to measure 5 oz.	To detect presence of Butyric Acid in valerianate of zinc. The salt is distilled with sulphuric acid, and the solution added to the distillate ; if Butyric Acid is present a bluish-white precipitate will result.
Albumen Rub up the white of 1 egg with 4 oz. of water, and filter through clean moistened tow.	To distinguish Monobasic Phosphoric Acid (with which it gives a precipitate) from the di- and tri-basic varieties (with which it does not afford a precipitate).
Ammonio-Nitrate of Silver Dissolve ¼ oz. of nitrate of silver in 8 oz. of water, and add as much solution of ammonia as will nearly redissolve the precipitate at first formed ; filter, and add as much water as will make the solution measure 10 oz.	Test for Arsenious Acid and Phosphoric Acid, with both of which it gives a yellow precipitate soluble in excess both of ammonia and nitric acid.
Ammonio-Sulphate of Copper Dissolve ½ oz. of sulphate of copper in 8 oz. of water, and add as much solution of ammonia as will nearly redissolve the precipitate at first formed ; filter, and add so much water as will make the solution measure 10 oz.	Test for Arsenious Acid, with which it gives a green precipitate, "Scheele's green," soluble in excess of ammonia.
Ammonio-Sulphate of Magnesium Dissolve 1 oz. of sulphate of magnesium and ½ oz. of chloride of ammonium in 8 oz. of water, add ½ oz. of solution of ammonia, and as much water as will make the solution measure 10 oz.	Test for Phosphoric Acid and Phosphates.
Boric Acid Dissolve 50 grains of boracic acid in 1 oz. of rectified spirit.	To detect presence of Turmeric (which it turns red) as an adulteration of rhubarb.

SOLUTION OF	TESTS.
Bromine Dissolve 10 minims of bromine in 5 oz. of water.	To test for presence of Iodine in bromide of potassium ; the addition of a few drops sets free the Iodine, which may be detected with mucilage of starch.
Perchloride of Gold Dissolve 60 grains of fine gold-leaf in a mixture of 1 oz. of nitric acid, 6 oz. of hydrochloric acid, and 4 oz. of water. Add then another ounce of hydrochloric acid, and evaporate at not above 212° until acid vapours are no longer given off. Dissolve the residue in 5 oz. of water.	Test for Atropine, with which it gives a citron-yellow precipitate.
Chloride of Tin Dissolve 1 oz. of granulated tin in a mixture of 3 oz. of hydrochloric acid and 1 oz. of water by the aid of a gentle heat until gas is no longer given off ; add as much water as will make the solution measure 5 oz.	Test for Mercury in ammoniated mercury, and for red oxide of mercury in gray powder.
Gelatine Digest 50 grains of isinglass and 1 oz. of water for half an hour in a water-bath, with frequent shaking ; filter through clean moistened tow.	To distinguish between Gallic and Tannic Acids : with the latter it gives a yellowish-white precipitate.
Iodide of Potassium Dissolve 1 oz. of Iodide of Potassium in 10 oz. of distilled water.	To detect the presence of Lead, which it precipitates as the iodide of lead, a bright yellow powder, sparingly soluble in cold, more so in hot water.
Perchloride of Platinum Pour a mixture of 1 oz. of nitric acid, 4 oz. of hydrochloric acid, and 2 oz. of water on ¼ oz. of platinum foil, and digest at a gentle heat, adding, if necessary, more of the acids in the same proportion until the metal is dissolved. Transfer the solution to a porcelain dish, add 1 drachm of hydro-	Test for Potassium, with which, in the presence of hydrochloric acid, it forms a sparingly soluble double salt. It is also used as a test for Nicotine, with which it gives a light-yellow precipitate.

SOLUTION OF	USES.
chloric acid, and evaporate on a water-bath until acid vapours are no longer evolved. Dissolve the residue in 5 oz. of water.	
Sulphate of Indigo - - - Heat 5 grains of indigo and $\frac{1}{2}$ drachm of sulphuric acid in a small test-tube over a water-bath for an hour. Pour the solution into 10 oz. of sulphuric acid, and when the undissolved indigo has subsided decant off the clear liquid.	Test for presence of free Chlorine, which decolorises it.
Sulphate of Calcium - - - Rub $\frac{1}{4}$ oz. of dry sulphate of calcium in a mortar with 2 oz. of water ; add this to 18 oz. of water, and, when the undissolved sulphate of calcium has subsided, decant off the clear liquid.	Test for Oxalic Acid.
Phosphate of Sodium - - - Dissolve 1 oz. of phosphate of sodium in 10 fluid oz. of water.	Test for Magnesium, also for Carbonate of Lithium.
Potassio-Mercuric Iodide - - Dissolve 135 grains of iodide of potassium and 100 grains of perchloride of mercury in 15 fluid oz. of boiling distilled water. To this more aqueous solution of the perchloride of mercury is added until a slight precipitate is permanent. Then 2 oz. of caustic soda are added. When dissolved, add more of the solution of perchloride of mercury, agitate and allow to settle, finally dilute with water to 1 pint.	Test for free Ammonia, with solutions of which it gives a brown colouration (Nessler's test).
Yellow Chromate of Potassium - Dissolve 295 grains of bichromate of potassium in 10 oz. of water, and exactly neutralise with bicarbonate of potassium, driving off CO_2 by boiling. Filter.	Is used in testing Bromide of Ammonium. It gives a red colour with nitrate of silver in the presence of any soluble bromide or iodide only if they are completely decomposed.

SOLUTION OF	USES.
Phenol-Phthalein - - - - Dissolve 1 grain of phenolphthalein in 500 grains of proof spirit. Solution should be colourless.	Is used to indicate the termination of reactions in volumetric operations.
Sulphydrate of Ammonium - - Pass sulphuretted hydrogen gas into an ounce of solution of ammonia until the gas is no longer absorbed.	Test for various metals, viz.:—Zinc, *white* precipitate; Mercury, Silver, Lead, Copper, Bismuth, Tin, Gold, and Platinum, *brown or black* precipitate. It affords no precipitate in a neutral solution of arsenic, but gives an *orange-red* precipitate in a neutral solution of antimony soluble in excess.
Tartaric Acid - - - - Dissolve 1 oz. of tartaric acid in 8 oz. of water, and add 2 oz. of rectified spirit.	Test for Potash.

We must here allude to two other important tests, viz., Sulphuretted Hydrogen Gas and Solution of Nitrate of Silver.

Sulphuretted Hydrogen Gas is a test for the metals—thus, it gives, in neutral and acid solutions containing *arsenic*, a yellow precipitate soluble in ammonia and in sulphydrate of ammonium, but insoluble in excess of hydrochloric acid; it gives, in solutions of *persalts of tin*, a yellow precipitate soluble in hydrochloric acid; it gives, in acid solutions of *proto-* and *per-salts* of *mercury*, salts of *silver*, *lead*, *copper*, *bismuth*, *protoxide of tin*, *gold*, and *platinum*, black or brown precipitates.

Nitrate of Silver is a test for *hydrochloric acid* and *chlorides*, with which it gives a white precipitate soluble in excess of ammonia, but not in nitric acid; for *hydrocyanic acid* and *cyanides*, with which it gives a white precipitate soluble in boiling nitric acid; for *tribasic phosphoric acid*, with which it gives a yellow precipitate soluble in excess of ammonia and nitric acid; and for *arsenic acid*, with which it gives a brick-red precipitate soluble in excess of ammonia and nitric acid.

III.

TEST SOLUTIONS FOR VOLUMETRIC ANALYSIS.

The following is a brief abstract of the method of preparing these solutions, and, in outline, an explanation of their use.

The Pharmacopœia gives the mode of procedure in volumetric estimations, according both to the British and Metric systems. We will confine ourselves to the consideration of the former, referring the student to the Pharmacopœia for information with regard to the Metric system.

Apparatus required in the Preparation of the Volumetric Solutions.

1. *A Flask* which, when filled to the mark on the neck, contains exactly 10,000 grains of distilled water, at 60° F.

2. *A Graduated Cylindrical Jar* which, when filled to 0, holds 10,000 grains of distilled water, and is divided into 100 equal parts.

3. *A Burette*, or graduated glass tube, which, when filled to 0, holds 1,000 grains of distilled water, and is divided into 100 equal parts, each part corresponding to 10 grain-measures.

Volumetric solutions, before being used, should be shaken so as to ensure uniformity of strength; they should also be preserved in stoppered bottles.

All measurements are to be made at 60° F.

The quantities of substances to be tested are expressed by grains in weight, while the quantities of the test solution employed are expressed in grain-measures. (A "grain-measure" is the volume of a grain of distilled water.)

I.—VOLUMETRIC SOLUTION OF BICHROMATE OF POTASSIUM.

($K_2CrO_4,CrO_3 = 295.$)

Preparation.—Dissolve 147·5 ($\frac{1}{2}$ equiv.) in a sufficiency of water to fill the 10,000 grain flask.

One thousand grain-measures of this solution will thus contain 14·75 grains of bichromate ($\frac{1}{20}$ of an equiv. in grains), and when added to a solution of a *proto*salt of iron acidulated with hydrochloric acid, can convert 16·8 grains of iron ($\frac{1}{20}$ of 6Fe in grains) from a state of *proto*salt to that of *per*salt. The molecular weight of $K_2Cr_2O_7$ being 295, $\frac{1}{20}$ of an equivalent=14·75—the smaller quantity being used for convenience of working. As one molecule of $K_2Cr_2O_7$ can convert six molecules of ferrous into a ferric salt, it follows that 14·75 grains of $K_2Cr_2O_7$ will peroxidise 16·8 grains (=$\frac{1}{20}$ of an equivalent) of 6Fe. (Fe=56; therefore, 6Fe=432, $\frac{1}{20}$ of which=16·8.)

Use.—To determine the amount of protosalt of iron present in a liquid. The conversion of all the protosalt into a state of persalt is known when a little drop of the liquid placed in contact with a drop of solution of ferricyanide of potassium on a white plate ceases to strike a blue colour.

The solution is used for determining the proportion of protoxide of iron in the following preparations:—

Grains weight.				Gr.-measures of Vol. Sol.
20	of Ferri	Oxid. Mag.	will require	230
20	,, ,,	Arsenias	,,	170
20	,, ,,	Phosphas	,,	250
20	,, ,,	Carb. Sacch.	,,	208

Example.—Twenty grains of magnetic oxide of iron dissolved in hydrochloric acid continue to give a blue precipitate with ferricyanide of potassium until 230 grain-measures of the volumetric solution have been added:—Thus

1,000 (the number of grain-measures in the solution) : 230 : : 21·6 (=$\frac{1}{20}$ of FeO). The result gives the amount of protoxide of iron in the 20 grains of magnetic oxide experimented on.

The following formula illustrates the nature of the decompositions which occur :—

$$K_2Cr_2O_7 + 6FeO + 8HCl = 3(Fe_2O_3) + Cr_2Cl_6 + 2KCl + 4H_2O.$$

II.—VOLUMETRIC SOLUTION OF HYPOSULPHITE OF SODIUM.

$$(Na_2H_2S_2O_4 4H_2O = 248.)$$

Preparation.—Dissolve 280 grains of hyposulphite of sodium in 10,000 grain-measures of water. Fill a burette with this solution, and drop it cautiously into 1,000 grain-measures of the volumetric solution of iodine until the brown colour is discharged. Note the number of grain-measures (n) required to produce this effect; then put 8,000 grain-measures of the same solution into a graduated jar, and augment this quantity by the addition of distilled water until it amounts to $\frac{8{,}000 \times 1{,}000}{n}$ grain-measures. If, for example, n=950, the 8,000 grain-measures of solution should be diluted to the bulk of $\frac{8{,}000 \times 1{,}000}{950}$=8,421 grain-measures.

One thousand grain-measures of this solution contain 24·8 grains of hyposulphite of soda, and therefore correspond to 12·7 grains of iodine ($\frac{1}{10}$ of an equivalent).

Use.—To estimate free iodine, which it does by forming, with the iodine, iodide of sodium and tetrathionate of sodium solutions of which are colourless, thus :—

$$2Na_2H_2S_2O_4 + 2I = \underbrace{Na_2S_4O_6}_{\text{Tetrathionate of Sodium}} + 2NaI + 2H_2O.$$

The following substances are directed to be tested with this solution :—

Grains weight.			Gr.-measures of Vol. Sol.
60·0	of Liq. Calc. Chloratæ	will require	500
70·0	„ „ Sodæ Chloratæ	„	500
439·0	„ „ Chlori	„	750
10·0	„ Calx Chlorata	„	850
12·7	„ Iodum	„	1,000

As no iodine is present in the first four of these preparations, the Pharmacopœia directs that solution of iodide of potassium and hydrochloric acid shall be added; so that the free iodine thus liberated in them may be indicated by the solution.

III.—VOLUMETRIC SOLUTION OF IODINE.

(I=127.)

Preparation.—Dissolve 127 grains of iodine and 180 grains of iodide of potassium in exactly 10,000 grain-measures of distilled water. One thousand grain-measures contain 12·7 grains ($\frac{1}{10}$ of an equiv.) of iodine, and therefore correspond to 1·7 grains of sulphuretted hydrogen, 3·2 grains of sulphurous acid, and 4·95 grains of arsenious acid.

Use.—Quantitative estimation of arsenious acid (*vide* p. 16), sulphurous acid, liquor arsenicalis, liquor arsenici hydrochloricus, and sulphuretted hydrogen. The solution is dropped from the burette into the liquid to be tested, until free iodine begins to appear in the solution.

The following substances are directed to be thus tested :—

Grains weight.			Gr.-measures of Vol. Sol.
4·0	of Acid. Arsenios.	will require	808
441·5	„ Liq. Arsenicalis	„	808
441·6	„ „ Arsen. Hydroch.	„	810
34·7	„ Acid. Sulphurosum	„	1,000

We cannot explain this test better than in the words of Dr. Attfield:[*] "Any substance which quickly absorbs a definite amount of oxygen may be quantitatively tested by ascertaining how much of an oxidising agent of known power must be added to a given quantity before complete oxidation is effected. The oxidising agents employed for this purpose in the British Pharmacopœia are iodine and the red chromate of potassium; permanganate of potassium is often used for the same purpose. Iodine acts indirectly, by taking hydrogen from water, and liberating oxygen; the red chromate of potassium directly, by the facility with which it yields 3-7ths of its oxygen." The following reactions will serve to illustrate the nature of the decomposition:—

---

[*] "Pharmaceutical Chemistry." Eleventh edition, 1885, p. 736.

$$\underbrace{2K_2Mn_2O_8}_{\text{Permanganate of Potassium.}} + 6H_2SO_4 = 2K_2SO_4 + 4MnSO_4 + 6H_2O + 5O_2.$$

$$\underbrace{As_2O_3}_{\text{Arsenious Acid.}} + 5H_2O + 2I_2 = \underbrace{2H_3AsO_4}_{\text{Arsenic Acid.}} + 4HI.$$

IV.—VOLUMETRIC SOLUTION OF NITRATE OF SILVER.

$(AgNO_3 = 170.)$

Preparation.—Dissolve 170 grains of nitrate of silver in exactly 10,000 grain-measures of distilled water. One thousand grain-measures will contain 17·0 grains of nitrate of silver ($\frac{1}{10}$ of an equiv. in grains).

Use.—Quantitative estimation of hydrocyanic acid, bromide of potassium, and arseniate of soda.

Grains weight.			Gr.-measures of Vol. Sol.
270	of Acid. Hydrocyan.	will require	1,000
10	„ Potass. Bromid.	„	840
10	„ Sodæ Arsenias (dry)	„	1,613

Explanation.—The addition of nitrate of silver to hydrocyanic acid with excess of soda causes the formation of a *soluble* double cyanide of silver and sodium ($AgNaCy_2$) until all the hydrocyanic acid is exhausted, thus:—

$$AgNO_3 + 2NaCy = NaNO_3 + NaAgCy_2.$$

When all the hydrocyanic acid is thus expended in the formation of this double cyanide, the further addition of nitrate of silver will cause the precipitation of insoluble cyanide of silver. Hence, if we know the amount of nitrate of silver required to produce a permanent precipitate, we can calculate the amount of hydrocyanic acid present. [For full explanation of this test, see p. 30.]

V.—VOLUMETRIC SOLUTION OF OXALIC ACID.

$$(H_2C_2O_4.2H_2O = 126.)$$

Preparation.—Dissolve 660 grains of oxalic acid in exactly 10,000 grain-measures of water.

One thousand grain-measures contain 63 grains ($\frac{1}{2}$ of an equiv.) of oxalic acid, and will therefore neutralise *one* equivalent in grains of an alkali or alkaline carbonate, the oxalic radical being bivalent.

Use in estimating the following substances :—

Grains weight.			Gr.-measures of Vol. Sol.
52·3	of Ammon. Carb.	will require	1,000
191·0	„ Borax	„	1,000
85·0	„ Liq. Ammon.	„	500
52·3	„ „ „ Fort.	„	1,000
4375·0	„ „ Calcis	„	180
460·2	„ „ „ Sacch.	„	254
284·5	„ „ Plumbi Subacet.	„	500
462·9	„ „ Potassæ	„	482
4375·0	„ „ „ Efferves.	„	150
458·0	„ „ Sodæ	„	470
4375·0	„ „ „ Efferves.	„	178
38·0	„ Plumbi Acetas	„	200
56·0	„ Potassa Caustica	„	900
50·0	„ „ Bicarb.	„	500
83·0	„ „ Carb.	„	980
102·0	„ „ Citras.	„	1,000
122·0	„ „ Tartras.	„	990
204·0	„ „ „ Acida	„	1,000
40·0	„ Soda Caustica	„	900
141·0	„ „ Tartarata	„	990
84·0	„ „ Bicarb.	„	1,000
143·0	„ „ Carb.	„	960
23·0	„ Sodium	„	975

Exact neutralisation is ascertained by litmus-paper.

VI.—VOLUMETRIC SOLUTION OF SODA.

($NaHO = 40$.)

Preparation.—"Fill a burette with the solution of soda, and cautiously drop this into 1,000 grain measures of the volumetric solution of oxalic acid until the acid is exactly neutralised. Note the number of grain-measures (n) of the solution used, and having then introduced 9,000 grain-measures of the solution of soda into a graduated jar, augment this quantity by the addition of water until it becomes $\frac{9{,}000 \times 1{,}000}{n}$ grain-measures. If, for example, $n = 930$, the 9,000 grain-measures should be augmented to $\frac{9{,}000 \times 1{,}000}{930}$ $= 9·677$ grain-measures. One thousand grain-measures of this solution contain one equivalent in grains (40) of hydrate of soda, and will therefore neutralise one equivalent in grains of any monobasic acid." [See p. 21 and *passim* under the different acids for full explanation.]

Use in testing the following substances:—

Grains weight.						Gr.-measures of Vol. Sol.
445·4	of	Acetum			will require	402
182·0	„	Acid.	Acet.		„	1,000
440·0	„	„	„	Dil.	„	313
60·0	„	„	„	Glac.	„	990
70·0	„	„	Citric		„	1,000
810·0	„	„	Hydrobrom. Dil.		„	1,000
114·8	„	„	Hydrochlor.		„	1,000
345·0	„	„	„	Dil.	„	1,000
120·0	„	„	Lacticum		„	1,000
800·0	„	„		Dil.	„	1,000
90·0	„	„	Nitric		„	1,000
361·3	„	„	„	Dil.	„	1,000
352·0	„	„	Nitro-Hydroch. Dil.		„	883
50·0	„	„	Sulph.		„	1,000
195·0	„	„	„	Arom.	„	500
359·0	„	„	„	Dil.	„	1,000
25·0	„	„	Tart.		„	330

WEIGHTS AND MEASURES OF THE BRITISH PHARMACOPŒIA.

WEIGHTS.

1 Grain	gr.	
1 Ounce	oz.	= 437·5 grains.
1 Pound	lb. = 16 ounces	= 7000 ,,

MEASURES OF CAPACITY.

1 Minim	min.	
1 Fluid Drachm	fl. drm.	= 60 minims.
1 Fluid Ounce	fl. oz.	= 8 fluid drachms.
1 Pint	O.	= 20 fluid ounces.
1 Gallon	C.	= 8 pints.

MEASURES OF LENGTH.

1 Line = $\frac{1}{12}$ inch.
1 Inch = $\frac{1}{39\cdot1393}$ seconds pendulum.
12 Inches = 1 foot
36 ,, = 3 feet = 1 yard.

Length of pendulum vibrating seconds of mean time in the latitude of London, in a vacuum at the level of the sea } 39·1393 inches.

RELATION OF MEASURES TO WEIGHTS.

				Grains of Water.
1 Minim	is the measure of			0·91
1 Fluid Drachm	,,	,,		54·68
1 Fluid Ounce	,,	,,	1 oz., or	437·5
1 Pint	,,	,,	1·25 lb., or	8750·0
1 Gallon	,,	,,	10 lb., or	70000·0

WEIGHTS AND MEASURES OF THE METRICAL SYSTEM.

WEIGHTS.

		Grammes.
1 Milligramme	=the thousandth part of 1 grm., or	0·001
1 Centigramme	=the hundredth ,,	0·01
1 Decigramme	=the tenth ,,	0·1
1 Gramme	=weight of a cubic centimetre of water of 4° C.	1·0
1 Decagramme	=ten grammes	10·0
1 Hectogramme	=one hundred grammes	100·0
1 Kilogramme	=one thousand ,,	1000·0

MEASURES OF CAPACITY.

1 Millilitre =	1	cub. centim.,	or mea. of	1	grm.	of water.
1 Centilitre =	10	,,	,,	10	grms.	,,
1 Decilitre =	100	,,	,,	100	,,	,,
1 Litre =	1000	,,	,,	1000	,,	1 kilo.

MEASURES OF LENGTH.

1 Millimetre	= the thousandth part of 1 metr., or	0·001	metr.
1 Centimetre	= the hundredth ,, ,,	0·01	,,
1 Decimetre	= the tenth ,, ,,	0·1	,,
1 Metre	= the ten-millionth part of a quarter of the meridian of the earth.		

RELATION OF THE WEIGHTS OF THE BRITISH PHARMACOPŒIA TO THE METRICAL WEIGHTS.

1 Pound = 453·5927 grammes.
1 Ounce = 28·3495 ,,
1 Grain = 0·0648 gramme.

RELATION OF MEASURES OF CAPACITY OF THE BRITISH PHARMACOPŒIA TO THE METRICAL MEASURES.

1 Gallon = 4·543458 litres.
1 Pint = 0·567932 litre, or 567·932 cub. centimetr.
1 Fluid Ounce = 0·028397 „ 28·397 „
1 Fluid Drachm = 0·003550 „ 3·550 „
1 Minim = 0·000059 „ 0·059 „

RELATION OF THE METRICAL WEIGHTS TO THE WEIGHTS OF THE BRITISH PHARMACOPŒIA.

1 Milligramme = 0·015432 gr.
1 Centigramme = 0·15432 „
1 Decigramme = 1·5432 grs.
1 Gramme = 15·432 „
1 Kilogramme = 2 lb. 3 oz. 119·8 grs., or 15432·349 „

RELATION OF THE METRICAL MEASURES TO THE MEASURES OF THE BRITISH PHARMACOPŒIA.

1 Millimetre = 0·03937 inch.
1 Centimetre = 0·39371 „
1 Decimetre = 3·93708 inches.
1 Metre = 39·37079 „ or 1 yard 3·37 inches.
1 Cubic Centimetre = 15·432 gr.-measr.
1 Litre = 1 pint 15 oz. 1 dr. 43 m., or 1·76077 pint.

INDEX.

Absolute alcohol, 378
Acaciæ gummi, 195
Aceta, 313
Acetum, 313
cantharides, 314
scillæ, 314
Acetate of ammonium, liquor, 40
of iron, liquor, 346
of lead, 97, 98
of morphine, 153, 155
of potassium, 103, 111
of zinc, 138, 139
Acetic acid, 9, 17, 21
ether, 416
Acids, table of the, 9, 10, 11
dilute, 312
Acidum aceticum, 9, 17, 21
dilutum, 312
glaciale, 9, 14, 22
arseniosum, 9, 17, 22
benzoicum, 10, 18, 24
boricum (vel boracicum), 10, 20, 24
carbolicum, 10, 17, 25
chromicum, 10, 20, 26
citricum, 10, 15, 26
gallicum, 10, 19, 27
hydrobromicum dilutum, 10, 20, 28
hydrochloricum, 11, 14, 28
dilutum, 312
hydrocyanicum dilutum, 11, 14, 29
lacticum, 11, 20, 30
dilutum, 312
meconicum, 21, 31, 151, 152
nitricum, 11, 15, 31
dilutum, 312
Acidum nitro-hydrochloricum dilutum, 312
oleicum, 11, 21, 32
phosphoricum concentratum, 11, 19, 32
phosphoricum dilutum, 11, 312
salicylicum, 12, 21, 33
sulphuricum, 12, 13, 33
aromaticum, 312
dilutum, 312
sulphurosum, 12, 13, 34
tannicum, 12, 18, 34
tartaricum, 12, 16, 35
Acipenser, 302
Aconella, 144
Aconite, 144
Aconitic acid, 144
Aconitina, 144
ointment of, 402
Aconitine, 144
Acrolein, 238
Actæa racemosa, 143
Adeps benzoatus, 298
preparatus, 298
Ægle marmelos, 165
Æther, 412, 415
aceticus, 412, 416
compound spirit of, 381
nitrous, 381
purus, 412, 415
spirit of, 380
sulphuricus, 412, 415
Æthereal extracts, 332
Albumen ovi, 301
solution of, 431
Alcohol, absolute, 378
amylicum, 379
ethylicum, 378

Alcoholic extracts, 330
Alexandrian senna, 191
Algarothi's powder, 47, 355
Alkaloids, preparation of the, 421
  solutions of, 360
Allspice, 204
Allyl, sulphocyanide of, 160
Almonds, bitter, 199
  Jordan, 200
  oil of, 366
  sweet, 200
Aloe Barbadensis, 284
  Socotrina, 284
Aloetic acid, 285
Aloin, 285
Alumen, 36
  exsiccatum, 37
Aluminium, 36
Amidic acid, 162
Ammoniacum, 213
  and mercury plaster, 325
  mixture, 363
Ammoniæ, linimentum, 338
  liquor, 341
   fortior, 341
  spiritus aromaticus, 382
   fœtidus, 382
Ammoniated mercury, 86, 89
  tincture of guaiacum, 392
   opium, 392
   quinine, 392
   valerian, 392
Ammonii acetatis, liquor, 348
   fortior, 348
  benzoas, 40
  bromidum, 40, 43
  carbonas, 39, 41
  chloridum, 39, 43
  citratis liquor, 39
   fortior, 39
  nitras, 40, 42
  oxalas, 40, 42
  phosphas, 39, 42
  sulphidum, 43
Ammonio-chloride of mercury, 86, 89
  citrate of iron, 72, 77
  nitrate of silver, solution of, 431
  sulphate of copper, solution of, 431
Ammonio-sulphate of magnesium, solution of, 431
Ammonium, compounds of, 37, 38
Amygdala amara, 199
  dulcis, 200
Amygdalæ oleum, 199
Amygdaline, 199, 201
Amyl nitris, 412, 417
  nitrite of, 412, 417
Amylic alcohol, 379
Amylum, 289
Amyridaceæ, 180
Anacardiaceæ, 180
Anacyclus pyrethrum, 230
Anethene, 216
Anethi fructus, 215
  oleum, 215
Anethum graveolens, 210
Angelic acid, 232
Angustura bark, 175
   false, 176
Angusturine, 176
Aniline, 197
Anise fruit, 213
  oil, 213
  water, 314
Aniseed, 213
Anisi, fructus, 213
  stellati fructus, 213
Anthemidis flores, 232
  oleum, 232
Anthemis nobilis, 230
Antimonial wine, 410
  powder, 375
Antimonii chloridi, liquor, 348
  oxidum, 45, 47
  potassio-tartras, 46, 48
Antimonium, compounds of, 44
  nigrum, 47
  sulphuratum, 45, 47
  tartaratum, 46, 48
Antimony, 44
  black, 47
  oxychloride of, 46
  sulphide of, 44
Apis mellifica, 303
Apocodeine, 152
Apomorphinæ hydrochloras, 153, 157
Apomorphine, 153
Aqua anethi, 315

Aqua anisi, 314
  aurantii floris, 314
  calcis, 64
  camphoræ, 314
  carui, 314
  chloroformi, 314
  cinnamomi, 314
  fœniculi, 314
  laurocerasi, 314
  menthæ piperitæ, 314
    viridis, 314
  pimentæ, 314
  rosæ, 314
  sambuci, 314
Aqueous extracts, 329
Arabic acid, 195
Arabin, 163, 195
Araroba powder, 196
Arctostaphylos uva ursi, 235
Argenti et Potassii nitras, 50, 52
  nitras, 50, 51
  oxidum, 50, 52
Argentum, compounds of, 50
Argol, 109
Aristolochiæ, 261
Aristolochia serpentaria, 261
Armoraciæ, radix, 160
  spiritus comp., 383
Arnica montana, 230
  tincture of, 389
Arnicin, 230
Aromatic mixture of iron, 364
  powder of chalk, 375
    and opium, 375
  spirits of ammonia, 382
  sulphuric acid, 312
Arseniate of iron, 72, 76
  of sodium, 128
Arsenic, compounds of, 49 (*vide* Acid arseniosum)
Arsenic, tests for, 23
Arsenii iodidi, 49
Arsenious acid, 9, 17, 22
Artemisia, 230
Asafœtida, 212
Asclepiadaceæ, 242
Aspartic acid, 248
Astragalus verus, 182
Atropaceæ, 247
Atropina, 248, 422
Atropine, 248, 422
Atropinæ sulphas, 249, 422
Atrosin, 248
Aurantiaceæ, 165
Aurantii floris, aqua, 314
  cortex, 166
  fructus, 166
Aurantiin, 166

Bael fruit, 167
Balsam, Canada, 276
  of Peru, 188
  of Tolu, 189
Balsamodendron myrrha, 180
Bang, 271
Barbadoes aloes, 284
Barium, chloride of, 429
Barley, 288
Barosma betulina, 175
Barosmine, 176
Bassorine, 185
Bearberry leaves, 235
Bebeeru bark, 260
Beberine, 260
Beberinæ sulphas, 260, 423
Beer yeast, 421
Belæ, extractum liquidum, 330
  fructus, 167
Belladonna, 248
Benzoate of ammonium, 40
Benzoic acid, 10, 18, 24
Benzoin, 236
Benzol, 428
Berberine, 145, 147
Bhang, 271 (*vide* Bang)
Biborate of sodium, 122, 129
Bicarbonate of potassium, 103, 112
  of sodium, 122, 129
Bichromate of potassium, 104, 112
Bichromate of potassium, volumetric solution of, 436
Bile (ox), 297
Bilifuscin, 297
Bilirubin, 297
Biliverdin, 297
Bismuth, 55
  lozenges, 398
Bismuthi carbonas, 56
  citras, 55, 57
  et ammonii citras, liquor, 55, 349
  oxidum, 56

Bismuth subnitras, 54, 57
Black antimony, purified, 47
  draught, 364
  wash, 362
Blistering collodion, 414
  paper, 320
  fluid, 361
Blue ointment, 403
  pill, 370
Bone black, 2
Boracic acid, 10, 20, 24
Borax, 122, 129
Boric acid, 10, 20, 24
Borneo camphor or borneol, 229
Brandy, 380
Brayera anthelmintica, 200
Bromine, 8
  solution of, 432
Bromum, 8
Broom-tops, 186
Brucine, 241
Bryoidin, 181
Buchu folia, 175
  leaves, 175
Buckthorn juice, 383
Burgundy pitch, 276
Burnett's solution, 353
Burnt alum, 37
Butyl chloral hydrate, 415
  sulphocyanide of, 161

Cabbage-rose petals, 201
Cacao butter, 167
Caffeina, 170
Caffeinæ citras, 170, 423
Caffeine, 170
Cajuput oil, 205
Calabar bean, 189
Calamina preparata, 138
Calamine, 136, 138
Calcareous waters, 316
Calcii carbonas precip., 62
  chloridum, 60, 62
  hydras, 62 (*vide* Calx)
  hypophosphis, 61, 63
  phosphas, 61, 63
  sulphas, 63
Calisaya bark, 219
Calomel, 84, 88
Calumba radix, 147
Calumbic acid, 147
Calumbin, 147
Calx, 63
  chlorinata, 64
  sulphurata, 65
Cambogia, 171
Camelia thea, 170
Camphic acid, 259
Camphine, 273
Camphor, 259
  artificial, 2
  Borneo, 259
  spirits of, 380
Camphoric acid, 259
Canada balsam, 276
Canarium commune, 180
Cane sugar, 291
Canella cortex, 172
Canellaceæ, 172
Cannabene, 271
Cannabin, 271
Cannabinaceæ, 270
Cannabis indica, 270
Cantharides, 306
Cantharidin, 306
Cantharis, 305
Caprifoliaceæ, 216
Capsici fructus, 246
Capsicin, 246
Capsicum, 246
Caraway fruit, 215
  oil, 215
Carbazotic acid, 26
Carbo animalis, 1
  purificatus, 2
  ligni, 2
Carbolic acid, 10, 17, 25
  glycerine of, 334
Carbon, 1
Carbonate of ammonium, 39, 41
  of bismuth, 56
  of lead, 97, 98
  of lime, precipitated, 62
  of lithium, 90
  of magnesium, 92, 93
  of magnesium (light), 92, 94
  of potassium, 103, 113
  of sodium, 130
  of sodium (dried), 130
  of zinc, 138, 140
Carbonated saline waters, 316

Cardamoms, 279
Cardamomi semina, 279
Carmine, 307
Carminic acid, 307
Carron oil, *vide* Lin. calcis, 338
Carui fructus, 215
    oleum, 215
Carvene, 215
Carvol, 215
Caryophylli oleum, 203
Caryophylline, 204
Caryophyllum, 203
Cascara sagrada, 179
Cascarilla bark, 262
Cascarillæ cortex, 262
Cascarillin, 263
Casein, 296
Cassia (senna), 183
Cassiæ pulpa, 192
Castor oil, 263
Cataplasma carbonis, 319
    conii, 319
    fermenti, 319
    lini, 319
    sinapis, 319
    sodæ chlorinatæ, 319
Cataplasmata, 318
Catechin, 186, 228
Catechu, 228
Catechuic acid, 228
Catechu tannic acid, 228
Cathartic acid, 191
Cathartin, 191
Caustic potash, 107, 110
    soda, 121, 128
Cellulin, 164
Cephaëlic acid, 227
Cephaëlis ipecacuanha, 217
Cera alba, 304
    glava, 304
Cerevisiæ fermentum, 421
Cerii oxalas, 66
Cerolein, 305
Cerotic acid, 305
Cetacea, 300
Cetaceum, 300
Cetine, 300
Cetraria, 293
Cetraric acid, 293
Cevadilla, 286
Chalk, 60
Chalk mixture, 363
    prepared, 60
    precipitated, 62
Chalybeate plaster, 325
    waters, 316
Chamomile flowers, 232
    oil, 232
Charcoal, 1, 2
    animal, 1
    poultice, 319
    vegetable, 2
Charta epispastica, 320
    sinapis, 320
Cherry laurel leaves, 201
Chillies, 246
Chirata, 242
Chiretta, 242
Chloral hydras, 418
Chlorate of potassium, 105, 114
Chloric ether, 380
Chloride of ammonium, 39, 43
    of antimony, 46
    of barium, solution of, 429
    of calcium, 60, 62
    of sodium, 127, 134
    of zinc, 136, 140, 353
Chlorinated lime, 64
    soda, 345
Chlorodyne, 397
Chloroform, 419
    spirits of, 380
Cholesterin, 297
Cholic acid, 297
Chondrodendron tomentosum, 147
Chromic acid, 10, 20, 26
Chrysarobin, 196
Chrysarobinum, 196
Chrysophanic acid, 196
Churrus, 270
Cimicifuga, 145
Cimicifugæ rhizomes, 145
Cinæbene camphor, 231
Cinchona alkaloids, 222
    estimation of, 221
    bark, 218
        gray, 220
        pale, 219
        red, 219
        tests for, 221
        yellow, 219
Cinchonaceæ, 217

Cinchonæ cortex, 218
  rubræ cortex, 219
Cinchonidinæ sulphas, 226
Cinchonidine, 223
Cinchoninæ sulphas, 226
Cinchonine, 223
Cinnabar, 81
Cinnamin, 187
Cinnamic acid, 187
  hydride, 258
Cinnamol, 259
Cinnamon, 258
Cinnamomi cortex, 258
  oleum, 258
Cinnamomum camphora, 257
Cinnamyl, hydride of, 258
Cissampeline, 148
Citrate of ammonium, 39
  of bismuth, 57
  of bismuth and ammonium, 58
  of bismuth and ammonium liquor, 56
  of caffeine, 170, 423
  of iron and ammonium, 72, 77
  of iron and quinine, 73, 77
  of lithium, 90
  of magnesium, 93
  of potassium, 104, 115
Citrene, 166
Citrylene, 166
Citric acid, 10, 15, 26
Citrine ointment, 404
Citrus vulgarus, 165
  limonum, 165
Cloves, 203
Coca, 169
Cocainæ hydrochloras, 169, 424
Cocaine, 169
Cocoa-butter, 168
Coccus cacti, 306
Cochineal, 307
Codamine, 152, 157
Codeina (codeia), 156
Cod-liver oil, 302
Coffea Arabica, 170
Coffee, 170
Colchicum, 237
Colchicine, 288
Coleoptera, 305
Collodion, 412
Collodium, 414
  flexile, 414
  vesicans, 414
Colocynth, 206
Colocynthin, 206
Compositæ, 230
Condy's fluid, 353
Confectio gallicæ, 321
  opii, 321
  piperis, 321
  rosæ caninæ, 321
  scammonii, 322
  sennæ, 322
  sulphuris, 321
  terebinthinæ, 222
Confectiones, 321
Coniferæ, 272
Conhydrine, 211
Conine, 211
Conii folia, 210
  fructus, 210
Conium maculatum, 208
Convolvulaceæ, 243
Convolvulin, 244
Convolvulus scammonia, 243
Copaiba, 194
Copaibæ oleum, 195
Copaifera multijuga, 183
Copaiva, 194
Copaivic acid, 194
Copper, nitrate of, 67
  subacetate of, 67
  sulphate of, 67
    anhydrous, 67
Coriander fruit, 215
Coriandri fructus, 215
Coriandrum sativum, 209
Cornutine, 290
Corrosive sublimate, 84, 86
Cotton-wool, 164
Cream of tartar, 109
Creasol, 275
Creasote, 275
  mixture of, 364
  vapour of, 364
Creasotum, 275
Creta, 65
  præparata, 65
  præcipitata, 62
Crocus sativum, 279

Croton chloral hydrate, 418
    eleuteria, 263
    tiglium, 263
    oil, 263
        liniment of, 339
Crotonic acid, 263
Cruciferæ, 159
Cubeba, 266
Cubebic acid, 266
Cubebin, 266
Cubebs, 266
    oil of, 266
    oleo-resin of, 266
Cucurbitaceæ, 206
Cupri nitras, 67
    sub-acetas, 429
    sulphas, 67, 68
Cupuliferæ, 268
Curd soap, 298
Curcuma longa, 278
Cusparia, 175
Cusparine, 176
Cusso, 200
Cymol, 259

Dandelion, 233
Daphne mezereon, 261
Daphnin, 262
Datura stramonium, 247
Daturine, 249
Deadly nightshade, 248
Decocta, 322
Delphinine, 146
Dextrin, 289
Dextrose, 304
Dialysed iron, 350, 357
Dialysis, operation of, 350
Digitalein, 251
Digitalin, 251
Digitalis, 251
Dill fruit, 215
    water, 314
Diosmin, 175
Discs of atropine, 337
    of cocaine, 337
    of physostigmine, 337
Dog rose, 201
Dolomite, 92
Donovan's solution, 349, 356
Dorema ammoniacum, 209
Dover's powder, 376

East India senna, 190
Ecbalii fructus, 207
Ecgonine, 169
Eggs, 301
Egg albumen, 31
    flip, 363
Elaterin, 208
Elaterinum, 208
Elaterium, 207
Elder flowers, 216
Elemi, 180
Elemin, 180
Ellagic acid, 269
Emetine, 227
Emplastra, 325
Emulsine, 201
Enemata, 327
Epispastic paper, 317
    solution, 316
Epsom salts, 92
Equivalent weights, 444
Ergot, 290
Ergotin, 290
Ergotinic acid, 290
Ergotinum, 290
Ergotinine, 290
Ericaceæ, 235
Erucic acid, 160
Erythroxylon coca, 169
Erythroxylaceæ, 169
Eserine, 188
Essentia anisi, 328
    menthæ piperitæ, 328
Essentiæ, 328
Ether, 412, 415
    acetic, 412, 416
    nitrous, spirit of, 381
    purus, 412, 415
    spirit of, 380
    sulphuric, 412, 415
Ethereal extracts, 332
    tincture of lobelia, 392
Ethyl acetate, 414
Ethylate of sodium, solution of, 359
Ethylic alcohol, 378
Eucalyptol, 205
Eucalypti folia, 205
Eucalyptus oil, 205
Eugenic acid, 204
Eugenine, 204

Euphorbiaceæ, 262
Euryangium sumbul, 210
Extracts, 328
Extractum aconiti, 329
  aloes bark, 329
    socot., 329
  anthemides, 330
  belæ liquidum, 330
  belladonnæ, 329
    alcoholicum, 331
  calumbæ, 330
  cannabis indicæ, 330
  cascaræ sagradæ, 331
    liquidum, 333
  cimicifugæ liquidum, 333
  cinchonæ liquidum, 333
  cocæ liquidum, 333
  colchici, 329
    aceticum, 329
  colocynth comp., 329
  conii, 329
  ergotæ liquid., 333
  filicis liquid., 333
  gelsemii alcoholicum, 331
  gentianæ, 330
  glycyrrhizæ, 330
    liquid., 333
  hæmatoxylis, 330
  hyoscyami, 329
  jaborandi, 331
  jalapæ, 331
  krameriæ, 330
  lactucæ, 329
  lupuli, 331
  mezerei æthereum, 329
  nucis vomicæ, 330
  opii, 330
    liquid., 333
  papaveris, 331
  pareiræ, 339
    liquid., 333
  physostigmatis, 330
  quassiæ, 330
  rhamni frangulæ, 331
    liquid., 333
  rhei, 331
  sarsæ liquidum, 333
  stramonii, 329
  taraxaci, 329
    liquid., 333

Farina tritici, 289
Fel bovinum purificatum, 296
Fennel fruit, 214
  water, 314
Fern, male, 292
Ferri acetatis liquor, 349
    fortior, 349, 356
  tincture, 389
  arsenias, 72, 76
  carbonas saccharata, 71, 77
  dialysatus liquor, 350, 357
  et ammonii citras, 72, 77
  et quininæ citras, 73, 77
  iodidum, syrupus, 386
  perchloridi liquor, 347
    fortior, 350, 357
    tincture, 389
  pernitratis liquor, 350, 357
  peroxidum hydratum, 75, 78
  persulphatis liquor, 351, 358
  phosphas, 72
  potassio-tartras, 74, 80
  sulphas, 70, 79
    exsiccata, 71, 79
    granulata, 71, 79
Ferricyanide of potassium, 109, 117
Ferrocyanide of potassium, 106, 117
Ferruginous waters, 316
Ferula galbaniflua, 209
Ferula narthex, 209
Ferrum, compounds of, 74
  redactum, 74, 79
  tartaratum, 74, 80
Ficus carica, 269
Figs, 269
Filices, 292
Filicic acid, 292
Filix mas, 292
Fleming's tincture, 397
Flexible collodion, 414
Flour, 289
Flowers of sulphur, 3
Fluid magnesia, 348
Fœniculi capillaceum, 209
Formyl, terchloride of, 420
  teriodide of, 419
Fousel oil, 379
Fowler's solution, 348, 352
Foxglove, the, 251
Frangula bark, 178
Frangulin, 178

Frankincense, 274
Fraxin, 240
Fraxinus ornus, 237
Friar's balsam, (*vide* Tr. Benzoin Co.), 393, 395
Fröhde's reagent, 154
Fusel oil (*vide* Fousel Oil), 379
    test for, 378

Gadus morrhuæ, 302
Galbanum, 212
    plaster, 325
Galipea cusparia, 174
Galla, 268
Gallic acid, 10, 19, 27
Galls, 269
Gallus Banckiva, 301
Gamboge, 171
Gambogic acid, 171
Gelatine, 302
    solution of, 432
Gelsemine, 242
Gelseminic acid, 242
Gelsemium, 241
    tincture of, 389
Gentianaceæ, 242
Gentian root, 242
Gentianic acid, 243
Gentianin, 243
Ginger, 278
Glacial acetic acid, 9, 14, 22
Glauber's salts, 123, 133
Glonoine (*vide* Nitroglycerin), 238, 417
Glucose, 291, 296, 304
Gluten, 239
Glycerina, 334
Glycerine, 238
Glycerinum, 238
Glycocholate of sodium, 297
Glycocholic acid, 297
Glycyrretin, 184
Glycyrrhiza, 181
Glycyrrhizæ, pulv. comp., 375
Glycyrrhizine, 184
Goa powder, 196
Gossypium, 164
Goulard's Extract, 352
Goulard water, 352
Graminaceæ, 288
Granati radicis cortex, 205
Grape sugar, 304
Grapes, 173
Graves' Pill, 374
Green extracts, 328
Gregory's Powder, 376
Gray powder, 82
Griffiths' Mixture, 364
Guaiacol, 275
Guaiaci lignum, 173
    resina, 173
Guaiacic acid, 173
Guaiaconic acid, 173
Guaiacum mixture, 363
    resin, 173
    wood, 173
Guaiaretic acid, 173
Guarana, 168
Guaranine, 168
Gum acacia, 195
Gummic acid, 195
Gun-cotton, 412
Gunjah, 270
Gutta-percha, 236
    liquor, 361
Guttiferæ, 170

Hæmatoxyli lignum, 190
Hæmatoxylin, 190
Hard soap, 239
Hardness of water, 312
    removal of, 312
Hashish, 271
Heberden's Ink, 364
Hellebore, Green, 285
Hemidesmic acid, 242
Hemidesmus root, 242
Hemiptera, 306
Hemlock, 208
Hemp (Indian), 270
Henbane, 249
Hepar sulphuris, 106, 111
Hesperidin, 166
Hips, 201
Hirudo, 307
Hoffmann's anodyne, 381
Hog's lard, 298
Honey, 304
Honey of borax, 362
Hop, 271
Hordeum, 288
Horseradish, 160

Humulin, 271
Humulus lupulus, 270
Hydrargyri iodidum rubrum, 85, 86
    nitratis liquor acidus, 351, 358
    nitrico-oxidum, 84, 86
    oxidum flavum, 85, 86
        rubrum, 84, 86
    perchloridum, 84, 86
    persulphas, 83
    subchloridum, 84, 88
Hydrargyrum, 82
    ammoniatum, 86, 89
    cum cretâ, 82
Hydrate of butyl chloral, 417
    of chloral, 418
    of potassium, 107, 110
    of sodium, 121, 128
Hydrated peroxide of iron, 75, 78
Hydrobromic acid, dilute, 10, 20, 28
Hydrochlorate of apomorphine, 153, 157, 422
    of cinchonine, 223, 424
    of cocaine, 169, 424
    of morphine, 153, 156, 425
    of quinine, 225, 426
Hydrochloric acid, 11, 14, 28
    dilute, 309
Hydrocyanic acid, dilute, 11, 14, 29
Hymenoptera, 303
Hyoscyamus, 249
Hyoscyamine, 249
Hypophosphite of calcium, 61, 63
    of sodium, 124, 131
Hyposulphite of sodium, 124, 131

Iceland moss, 293
Igasuric acid, 241
Igasuriæ, 241
Illicum anisatum, 213
Indian hemp, 270
Indican, 197
Indiglucin, 197
Indigo, 196
    sulphate, solution of, 197, 433
Indigotin, 197
Infusa, 334
Injectiones, 336
Inverted sugar, 291, 305
Iodate of potassium, test for, 115
Iodi liquor, 339
Iodide of arsenium, 49
    of iron, 70
    of lead, 97, 99
    of potassium, 108, 115
    of sodium, 125, 131
    of sulphur, 3, 5
Iodine, 7
    volumetric solution of, 438
Iodoform, 421
Iodum, 7
Ipecacuanha, 227
Ipecacuanhic acid, 227
Ipomæa purga, 243
Ipomæic acid, 246
Indicaceæ, 279
Iron, 74
    compounds, 74
Isinglass, 302
Isonandra gutta, 235

Jaborandi, 177
Jalap, 245
    resin, 245
Jalapa, 245
Jalapæ resina, 245
Jalapin, 245
James's Powder, 375
Jateorrhiza calumba, 147
Jecoris, oleum, 302
Jordan almonds, 200
Juices, 383
Juniper oil, 277
Juniperus communis, 277
    sabinis, 277

Kalium (*vide* Potassium), 100
Kamala, 264
Kelp, 7
Kino, 186
Kino-tannic acid, 136
Koussine, 200
Koussy, 200
Krameria, 162
Krameric acid, 162

Labarrague's Disinfecting Fluid, 345
Labiatæ, 252
Lac, 297

Lactic acid, 11, 20, 30
dilute, 312
Lacmus, 293
Lactose, 296
Lactuca, 233
Lactucarium, 233
Lactucic acid, 233
Lævulose, 291, 305
Lamellæ, 337
Lanthopine, 158
Larch bark, 276
Lard, benzoated, 298
prepared, 298
Laricis cortex, 276
Larixin, 276
Larixinic acid, 276
Laudanine, 157
Laudanum (*vide* Tinctura opii), 397
Lauraceæ, 257
Laurel water, 317
Laurocerasi folia, 201
Lavandulæ oleum, 253
Lavender, 253
oil, 253
Lead, compounds of, 96
plaster, 325
Leech, 307
Leguminosæ, 181
Lemon juice, 166
oil, 166
peel, 166
Lettuce, 233
Lichenes, 292
Lichenin, 293
Lignin, 164
Lignum vitæ, 173
Liliaceæ, 282
Lime, *vide* Calx, 63
chlorinated, 64
slaked, 63
sulphate of, 63
water, 342
Limonin, 166
Limonis cortis, 166
oleum, 166
succus, 166
Linaceæ, 163
Lineolic acid, 164
Lini farina, 163
oleum, 163
semina, 163
Linimenta, 337
Linoxin, 164
Linseed, 163
meal, 163
oil, 163
poultice, 319
Liquidambar Orientale, 267
Liquidambaraceæ, 267
Liquid extracts, 332
Liquor acidi chromici, 348
ammoniæ, 341
fortior, 341
ammonii acetatis, 348
fortior, 348
citratis, 348
fortior, 348
antimonii chloridi, 348, 355
arsenicalis, 348, 355
arsenici hydrochloricus, 349, 356
arsenici et hydrargyri iodidi, 349, 356
atropinæ sulphatis, 360
bismuth et ammonii citratis, 349, 356
calcii chloridi, 349
calcis, 341
chlorinatæ, 345
saccharatus, 341
chlori, 339
epispasticus, 361
ferri acetatis, 349
fortior, 349, 356
dialysatus, 350, 357
perchloridi, 350
fortior, 350, 357
pernitratis, 350, 357
persulphatis, 351, 358
gutta-percha, 361
hydrargyri nitratis acidus, 351, 358
hydrargyri perchloridi, 351
iodi, 339
lithiæ effervescens, 344
magnesii carbonatis, 351, 358
magnesii citratis, 352, 358
morphinæ acetatis, 360
bimeconatis, 360
hydrochloratis, 360
plumbi subacetatis, 352, 358
dilutus, 352

Liquor plumbi potassæ, 341
      effervescens, 344
  potassii permanganatis, 353, 359
  sodæ, 341
    chlorinatæ, 345
    effervescens, 344
  sodii arseniatis, 353, 359
  ethylatis, 353, 359
  strychninæ hydrochloratis, 360
  zinci chloridi, 353
Liquores, 339
Liquorice, 184
Litharge, 96
Lithiæ carbonas, 90
  citras, 90
Lithium, 89
Litmus, 292
  solution of sulphate of, 433
Lobelia, 234
Lobeliaceæ, 234
Lobelic acid, 234
Loganiaceæ, 240
Logwood, 183
Lotio hydrargyri flava, 361
      nigra, 361
Lotiones, 361
Lozenges, 398
Lunar caustic, 51
Lupulin, 271
Lupulus, 271

Mace, 256
Magnesia levis, 94
  ponderosa, 93
Magnesii carbonas levis, 92, 94
      ponderosa, 92, 93
  carbonatis liquor, 351
  citratis liquor, 352
  sulphas, 92, 95
Magnesium, compounds of, 92
Magnetic oxide of iron, 75, 78
Magnoliaceæ, 146
Male fern, extract of, 332
Mallotus Philippinensis, 262
Malvaceæ, 164
Manna, 239
Mannite, 240
Margarin, 304
Marsh's test for arsenic, 23
Mastiche, 180
Mastichic acid, 180
Maticæ folia, 266
Matico, 266
Measures and weights, 442
Meconic acid, 21, 31, 151, 152
Meconidine, 158
Meconine, 153
Mel, 304
  boracis, 362
  depuratum, 362
Melanthaceæ, 285
Mellita, 362
Menispermaceæ, 147
Menthæ piperitæ oleum, 253
    viridis oleum, 254
Menthol, 253
Mercurial lotion, black, 362
      yellow, 361
  ointment, 403
  pill, 370
  plaster, 326
  suppositories, 384
Mercury, compounds of, 82
  ammoniated, 86, 89
  preparations containing, 82
Metagallic acid, 28
Mezereon, 262
Mezerei cortex, 262
Milk, 296
  of sulphur, 3, 4
  sugar, 296
Mimo-tannic acid, 187
Mineral waters, 316
Mistura ammoniaci, 363
  amygdalæ, 363
  camphoræ, 364
  creasoti, 364
  cretæ, 363
  ferri aromatica, 364
    comp., 364
  guaiaci, 363
  scammonii, 363
  sennæ comp., 364
  spiritus vini gallici, 363
Misturæ, 362
Mitigated caustic, 50, 52
Monkshood, 144
Moraceæ, 269
Mori succus, 270

Morphinæ acetas, 153, 155
      preparation of, 425
      bimeconas, 425
  hydrochloras, 153, 156
      preparation of, 425
  sulphas, 156, 425
Morphine, 153
Morrhuæ oleum, 302
Morus niger, 270
Moschus moschiferus, 294
Mucic acid, 195
Mucilage of starch, 365
Mucilagines, 365
Mulberry juice, 270
Musk, 295
Mustard, 159
  liniment of, 339
  oil of, 160
  paper, 320
  poultice, 319
Myricin, 256
Myristic acid, 257
Myristica, 256
Myristicaceæ, 256
Myristicæ oleum, 256
      expressum, 256
Myristicol, 257
Myronic acid, 160
Myrosine, 160
Myroxylon pareiræ, 182
    toluiferum, 182
Myrrh, 180
Myrrha, 180
Myrrhol, 180
Myrtaceæ, 203

Narceine, 153
Narcotine, 158
Natrium, *vide* Sodium, 121
Nectandra rodiæi, 258
Neroli, oil of, 166
Nicotiana tabacum, 247
Nicotine, 250
Nitrate of ammonium, 40, 42
    of copper, 67
    of lead, 97, 99
    of mercury, acid solution of, 351, 358
    of pilocarpine, 178, 426
    of potassium, 110, 116
    of silver, 50, 51
Nitrate of silver and potassium, 50, 52
    of sodium, 125, 132
Nitre, 110, 116
Nitric acid, 11, 15, 31
      dilute, 309
Nitrite of amyl, 417
Nitroglycerin, 238, 417
Nitro-hydrochloric acid, dilute, 309
Nitrous ether, spirit of, 381
Nutmeg, 256
    expressed oil of, 256
    volatile oil of, 256
Nux vomica, 240

Oak bark, 268
Oil of Neroli, 166
  of vitriol, *vide* Acid sulphuric, 13, 33
Ointments, 400
Olea, 365
Oleaceæ, 237
Oleata, 369
Oleate of mercury, 369
    of zinc, 369
Oleatum hydrargyris, 369
    zinci, 369
Oleic acid, 11, 21, 32
Olein, 237
Oleum amygdalæ, 200, 366
  anethi, 215
  anisi, 213
  anthemidis, 232
  cajuputi, 205
  carui, 215
  caryophylli, 203
  cinnamomi, 258
  copaibæ, 195
  coriandri, 215
  crotonis, 263
  cubebæ, 266
  eucalypti, 205
  juniperi, 277
  lavandulæ, 253
  limonis, 166
  lini, 163
  menthæ piperitæ, 253
      viridis, 254
  morrhuæ, 303
  myristicæ, 256
      expressum, 256

Oleum olivæ, 237, 369
  phosphoratum, 5, 367
  pimentæ, 366
  pini sylvestris, 275
  ricini, 263
  rosmarini, 253
  rutæ, 176
  sabinæ, 277
  santali, 264
    flavi, 264
  terebinthinæ, 273
  theobromatis, 168
Olive oil, 237, 369
Ophelia chirata, 242
Opianine, 158
Opium, 150
  acids, 151
  alkaloids, 152
Opodeldoc, *vide* Lin. sap. co., 337
Orange, 166
Orange-flower water, 314, 317
  peel, bitter, 166
  wine, 410
Orcin, 293
Ovi albumen, 301
  vitellus, 301
Ovis aries, 294
Oxalate of cerium, 66
Oxalic acid, volumetric solution of, 440
Ox bile, 296
  gall, 296
Oxide of antimony, 45, 47
  of bismuth, 56
  of lead, 99
  of mercury (red), 84, 86
    (yellow), 85, 86
  of silver, 50, 52
  of zinc, 139, 140
Oxymel, 362
  scillæ, 362

Pachydermata, 294
Palmitate of cetyl, 301
Palmitin, 237
Papaver rhœas, 149
  somniferum, 149
Papaveraceæ, 149
Papaverine, 152, 157
Papaveris capsulæ, 150
Paraffin, 142
Paraffin wax, 142
Paraffinum durum, 142
  molle, 142
Paramorphine, 158
Paregoric elixir, 397
Pareira root, 147
Pearl barley, 288
Pellitory root, 231
Pelosine, 149
Pepper, 265
Peppermint, 253
  camphor, 253
  oil, 253
Pepsin, 299
Perchloride of iron, liquor, 350, 357
  of mercury, 84, 86
    solution of, 351
Permanganate of potassium, 108, 117
Pernitrate of iron, liquor, 350, 357
Peroxide of iron, 75, 78
Persulphate of iron, liquor, 351, 358
  of mercury, 83
Peru, balsam of, 187
Pettenkofer's test for bile, 297
Phenic acid, *vide* Acid carbolic, 10, 17, 25
Phenol, 17, 25
Phosphate of ammonium, 39, 42
  of calcium, 61, 63
  of iron, 72
  of sodium, 125, 132
Phosphorated oil, 5, 367
Phosphoric acid, concentrated, 11, 19, 32
Phosphoric acid, dilute, 11, 302
Phosphorus, 5
  pill, 5, 372
Physostigma, 189
Physostigmin, 190
Picræna excelsa, 177
Pilocarpus pinnatifolia, 175
Pilocarpinæ nitras, 178, 426
Pilocarpine, 178
Pilula, 370
Pimaric acid, 274
Pimenta, 204
Pimentæ oleum, 366
Pimento, 204
Pimpinella anisum, 209

Pinic acid, 274
Pinus balsamea, 272
    larix, 272
    palustris, 272
    picea, 272
    sylvestris, 272
Piperaceæ, 265
Piper nigrum, 265
Piperin, 265
Pisces, 302
Pistacia lentiscus, 179
Pitch, 275
Pix Burgundica, 276
    liquida, 275
Planche's purgative potion, 363
Plasters, 325
Platinum, perchloride of, 432
Plumbi acetas, 97, 98
    carbonas, 97, 98
    iodidum, 97, 99
    nitras, 97, 99
    oxidum, 99
    subacetatis liquor, 98
Plummer's pill, *vide* Pil. Hydrarg. Subchlor. Co., 372
Podophylline, 145
Podophyllum, 145
    resina, 145
Polychroit, 279
Polygalaceæ, 161
Polygalic acid, 162
Polygonaceæ, 254
Pomegranate root bark, 205
Poppy capsules, 149
    red, petals of, 149
Potash, prussiate of, yellow, 106, 117
        red, 109, 117
    solution of, 341
    water, 341
Potassa, 107
    caustica, 107, 110
    fusa, 107
    sulphurata, 106, 111
Potassæ bitartras, 118
    liquor, 341
Potassii acetas, 103, 111
    bicarbonas, 103, 112
    bichromas, 104, 112
    bitartras, 109
    bromidum, 107, 113
Potassii carbonas, 103, 113
    chloras, 104, 114
    citras, 104, 115
    cyanidum, 109, 115
    ferricyanidum, 109, 117
    ferrocyanidum, 106, 117
    iodidum, 108, 115
    nitras, 110, 116
    permanganas, 108, 117
    sulphas, 110, 118
    tartras, 106, 118
        acida, 118
Potassium, compounds of, 100, 101

Poultices, 319
Powders, 374
Precipitated carbonate of lime, 62
        sulphur, 3, 4
Prepared chalk, 65
Proof spirit, 378
Propyl hydrate, 302
Propylamine, 302
Prunum, 200
Prussic acid, 11, 14, 29
Pseudo-aconitine, 144
Pseudo-morphine, 157
Pterocarpi lignum, 185
Pterocarpus marsupium, 182
Pulves, 374
Pulvis amygdalæ comp., 375
    antimonialis, 375
    catechu comp., 375
    cinnamomi comp., 375
    cretæ aromaticus, 375
        cum opio, 375
    elaterini comp., 375
    glycyrrhizæ comp., 375
    ipecacuanhæ comp., 376
    jalapæ comp., 376
    kino comp., 376
    opii comp., 376
    rhei comp., 376
    scammonii comp., 376
    tragacanth comp., 376
Pyrethric acid, 231
Pyrethrin, 231
Pyrethrum, 231
Pyrogallic acid, 28
Pyroxylin, 414

Quassia, 178

Quassine, 178
Querci-tannic acid, 268
Quercus cortex, 268
    lusitanica, 268
Quicksilver, 82
Quinic acid, 224
Quinicine, 223
Quinidine, 223
Quininæ hydrochloras, 225, 426
    sulphas, 224, 426
        adulterations, 226
Quinina, 222
Quinoidine, 224
Quinone, 224
Quino-tannic acid, 224
Quinovic acid, 224
Quinovin, 224

Raisins, 173
Ranunculaceæ, 143
Rasores, 301
Rectified spirit, 378
Red iodide of mercury, 85, 86
Red oxide of mercury, 84, 86
Red poppy petals, 149
Red precipitate, 84, 86
Red prussiate of potash, 109, 117
Reduced iron, 74, 79
    lozenges, 398
Reinsch's test for arsenic, 23
Remijia bark, 217
Resin, 274
    of guaiacum, 173
    of jalap, 245
    of podophyllum, 145
    of scammony, 244
Resina, 274
    unguentum, 406
Resorcin, 213
Rhamnaceæ, 179
Rhamni frangulæ cortex, 178
    purshiani cortex, 178
    succus, 383
Rhatanine, 162
Rhatany, 161
Rhei radix, 254
Rheum, 254
Rhœadine, 157
Rhœados petala, 158
Rhubarb, 255
Ricini oleum, 263
Ricinic acid, 263
Rochelle salt, 126, 133
Rock alum, 37
Rosaceæ, 198
Rosæ caninæ fructus, 201
    centifoliæ petala, 201
    gallicæ petala, 202
Rose petals, cabbage, 201
        red, 202
    water, 317
Rosemary oil, 253
Rottlerin, 264
Rue, 176
Rufus' pill, 371
Ruminantia, 294
Ruta, 176
Rutaceæ, 174
Rutæ oleum, 176
Rye, ergot of, 290

Sabadilla, 286
Sabadilline, 287
Sabinæ cacumina, 277
Saccharated carbonate of iron, 71, 77
        solution of lime, 342
Saccharum lactis, 296
        purificatum, 290
Saffron, 279
Safren, 260
Safrol, 260
Sal ammoniac, 39, 43
    volatile, spirits of, 382
Salicaceæ, 266
Salicin, 266
Salicinum, 266
Salicylate of sodium, 126, 132
Salicyl hydride, 33
Salicylic acid, 12, 21, 33
Saligenin, 267
Saline waters, 316
Salt, common, 127, 134
Sambuci flores, 216
Sandalwood, red, 185
        oil, 264
Santalaceæ, 264
Santalin, 185
Santalum album, 264
Sanguisuga medicinalis officinalis, 307
Santonica, 231

Santonin, 231
Santoninum, 231
Sapo animalis, 298
  durus, 239
  mollis, 239
Saponin, 146
Sapotaceæ, 235
Sarsæ radix, 280
Sarsaparilla, 231
Sassafras, 260
Savin, 277
Scammoniæ radix, 244
  resina, 244
Scammonium, 244
Scammony, 244
Scilla, 283
Scillitin, 284
Sclerotic acid, 290
Scoparii cacumina, 185
Scoparine, 185
Scotch paregoric, 397
Scott's ointment, 407
Scrophulariaceæ, 250
Secale cereale, 288
Secalia, 290
Senega root, 162
Senegin, 162
Senna alexandrina, 191
  indica, 191
Serpentary root, 261
Sevum præparatum, 295
Sherry, 410
Silver, compounds of, 50
  ammonio-nitrate of, solution of, 431
  nitrate of, 51
    volumetric solution of, 439
Simarubaceæ, 178
Sinapis alba, 159
  nigra, 159
Sinigrin, 160
Smilaceæ, 280
Smilacin, 282
Soap, animal, 298
  curd, 298
  hard, 239
  soft, 239
Soda caustica, 121, 128
  tartarata, 121, 128
Soda, volumetric solution of, 441
Sodæ chlorinatæ liquor, 345
Sodii arsenias, 128
  biboras, 129
  bicarbonas, 129
  bromidum, 130
  carbonas, 130
    exsiccata, 130
  chloridum, 127, 134
  citro-tartras effervescens, 124
  ethylatis liquor, 353, 359
  hypophosphis, 124, 131
  hyposulphis, 124, 131
  iodidum, 125, 131
  nitras, 125, 132
  phosphas, 125, 132
  salicylas, 126, 132
  sulphas, 126, 133
  sulphis, 126, 133
  sulphocarbolas, 126, 134
  valerianas, 126, 134
Sodium, 121, 127
  compounds of, 119
Soft paraffin, 142
  soap, 239
Solanaceæ, 246
Solid paraffin, 142
Solutions, 339
Spanish fly, 306
Sparteine, 185
Spearmint, 254
  oil, 254
Spermaceti, 300
Spirit (sweet) of chloroform, 381
  of nitre, 381
  of turpentine, 273
Spiritus, 377
  ætheris, 380
    comp., 381
    nitrosi, 381
  ammoniæ arom., 382
    fœtidus, 382
  armoraciæ comp., 383
  cajuputi, 380
  camphoræ, 380
  chloroformi, 381
  cinnamomi, 380
  juniperi, 380
  lavandulæ, 380
  menthæ piperitæ, 380
  myristicæ, 380

Spiritus rectificatus, 377
    test for, 378
  rosmarini, 380
  tenuior, 378
  vini gallici, 380
Squill, 283
Squirting cucumber, 207
Staphisagriæ semina, 146
Staphisagrine, 146
Star anise fruit, 146, 147
Starch, 289
Stavesacre seeds, 146
Stearin, 237
Sterculeaceæ, 167
Storax, 267
  solid, 267
Stramonium, 249
Strychnic acid, 241
Strychnine, 241
Strychnos nux vomica, 240
Styracaceæ, 237
Styracin, 267
Styrax benzoin, 236
  præparatus, 267
Styrol, 259, 267
Subchloride of mercury, 84, 88
Sublimed sulphur, 3
Subnitrate of bismuth, 54, 57
Succi, 383
Succinic acid, 232
Sucrose, 291
Suet, prepared, 295
Sugar, barley, 291
  of lead, 97, 98
  of milk, 296
  refined, 291
  varieties of, 291
Sulphate of atropine, 248, 422
  of beberine, 260, 423
  of calcium, 63
  of cinchonine, 226
  of cinchonidine, 226, 424
  of copper, 67, 68
    anhydrous, 67, 68
  of iron, 70, 79
    dried, 71, 79
  of magnesium, 92
  of potassium, 110, 118
Sulphate of quinine, 224, 426
  of sodium, 126, 133
  of zinc, 136, 141
Sulphite of sodium, 126, 133
Sulpho-carbolate of sodium, 126, 134
    of zinc, 139, 141
Sulpho-cyanide of allyl, 160
Sulphur, 3
  præcipitatum, 3, 4
  sublimatum, 3
Sulphurated antimony, 45, 47
    lime, 65
    potash, 106, 117
Sulphuretted hydrogen waters, 316
Sulphuric acid, 12, 13, 33
  aromatic, 312
  dilute, 312
Sulphuris iodidum, 3, 5
Sulphurous acid, 12, 13, 34
Sulphur-natus, 3
Sulphydrate of ammonium, 43
Sumbul, 216
Suppositoria, 384
Sus scrofa, 294
Sweet oil, 237
Sweet spirits of nitre, 381
Sylvic acid, 274
Syrupi, 385
Syrupus, 386
  aurantii, 387
    floris, 386
  chloral, 386
  ferri iodidi, 386, 387
    phosphatis, 388
  hemidesmi, 386
  limonis, 386
  mori, 386
  papaveris, 387
  rhei, 387
  rhœados, 387
  rosæ gallicæ, 386
  scillæ, 386
  sennæ, 386
  tolutanus, 386
  zingiberis, 386

Tabaci folia, 250
Tamarinds, 193
Tannic acid, 12, 18, 34
Tannin, 12, 13, 34
Tar, 275
Taraxacine, 233
Taraxacum, 233

Tartar emetic, 46, 48
Tartarated antimony, 46, 48
  iron, 74, 80
  soda, 121
Tartaric acid, 12, 16, 35
Tartrate of iron and potassium, 74, 80
  of potassium, 106, 118
  of potassium, acid, 118
  of sodium and potassium, 121, 128
Taurin, 297
Taurocholate of sodium, 297
Taurocholic acid, 297
Tea, 170
Teleostei, 302
Terebinthinæ Canadensis, 276
Terebinthinæ oleum, 273
Terpine, 274
Terpinol, 274
Test solutions, etc., 429
Thea, 170
Thebaïne, 158
Thebolactic acid, 151, 152
Theobroma cacao, 167
Theobroma oil, 167
Theobromine, 168
Theriaca, 291
Thorn apple, 249
Thus Americanum, 274
Thymelaceæ, 261
Thymol, 254
Tiglic acid, 263
Tincturæ, 389
Tobacco, 250
Tolu, 188
Toluene, 189
Tragacanth, 185
Treacle, 291
Triticum vulgare, 288
Trochisci, 398
Tropic acid, 248
Tropine, 248
Turmeric, 278
Turpentine, 273
  oil of, 273
  spirits of, 273
  Venice, 273

Umbelliferæ, 208
Uncaria Gambier, 218
Unguenta, 400
Unguentum acidi borici, 406
    cabolici, 406
    salicylici, 406
  aconitinæ, 402
  antim. tart., 405
  atropinæ, 402
  belladonnæ, 402
  calaminæ, 402
  cantharidis, 407
  cetacei, 407
  chrysarobini, 402
  citrinum, 405
  creasoti, 405
  elemi, 405
  eucalypti, 406
  gallæ, 402
    cum opio, 402
  glycerini plumbi subacetatis, 406
  hydrargyri, 403
    ammoniati, 405
    comp., 406
    iodidi rubri, 405
    nitratis, 404
      dilutum, 406
    oxidi rubri, 406
    subchloridi, 402
  iodi, 401
  iodoformi, 402
  picis liquidæ, 408
  plumbi acetatis, 402
    carbonatis, 405
    iodidi, 405
  potassæ sulphurata, 406
  potassii iodidi, 402
  resinæ, 406
  sabinæ, 405
  simplex, 405
  staphisagriæ, 402
  sulphuris, 402
    iodidi, 406
  terebinthinæ, 405
  veratrinæ, 406
  zinci, 402
    oleati, 406
Urginea scilla, 282
Uvæ, 172
Uvæ ursi folia, 235

Valerian, 229

Valerianaceæ, 229
Valerianate of sodium, 126, 134
    of zinc, 136, 141
Valerianic acid, 230
Valerole, 229, 271
Vapor acidi hydrocyanici, 408
    chlori, 408
    coninæ, 408
    creasoti, 408
    iodi, 408
    olei pini sylvestris, 408
Vapores, 408
Vaseline, 142
Veratri viridis rhizome, 286
Veratrine, 286
Veratrum viride, 286
Verdigris, 429
Vina, 409
Vinegar, 313
    of cantharides, 314
    of squills, 314
Vinum aloes, 409
    antimoniale, 410
    aurantii, 410
    colchici, 410
    ferri, 410
        citratis, 410
    ipecacuanhæ, 410
    opii, 410
    quininæ, 410
    rhei, 410
    xericum, 410
Vitaceæ, 173
Vitellin, 301
Vitis vinifera, 173
Vitriol, 12, 13, 33
    blue, 67, 68
Vitriol, green, 70, 79
    white, 136, 141
Volumetric solutions, 435
    tests, 429

Ward's paste, *vide* Conf. Piperis, 321
Waters, mineral, 316
Wax, white and yellow, 305
Weights and measures, 442
Wheat, 288
White arsenic, 9, 17, 22
White precipitate, 86, 89
    ointment, 406
Wines, 409
Winter's bark, 172

Yeast, 421
    poultice, 319
Yellow oxide of mercury, 85, 86
    prussiate of potash, 106, 117
    wash, 361
Yolk of egg, 301

Zinc, compounds of, 135
Zinci acetas, 138, 139
    carbonas, 138, 140
    chloridum, 136, 140
    oxidum, 139, 140
    sulphas, 136, 141
    sulphocarbolas, 139
    valerianas, 136, 141

Zingiber, 278
Zingiberaceæ, 277
Zygophyllaceæ, 172

THE END.

Baillière, Tindall & Cox, 20, King William Street, Strand.

4/D